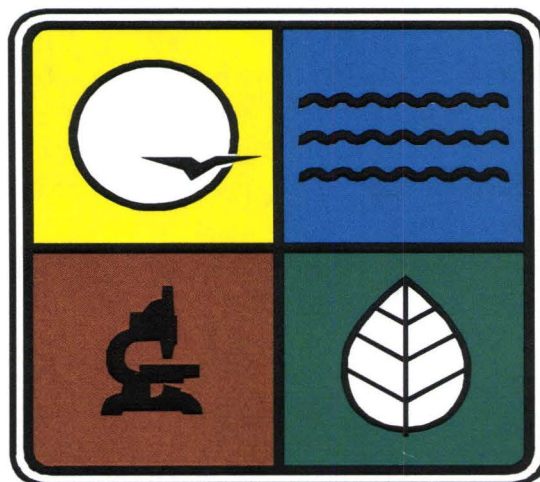


**OPERATION AND MAINTENANCE INSPECTION REPORT**

**Environmental Operations, Incorporated  
Former Solutia, J.F. Queeny Plant**



**Conducted By  
Missouri Department of Natural Resources**

**Division of Environmental Quality  
Hazardous Waste Program  
Missouri Geological Survey**

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RCRA



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## EXECUTIVE SUMMARY

The Solutia John F. Queeny Plant is located two miles south of downtown St. Louis, Missouri, at 201 Russell Boulevard. The Solutia Queeny Plant began operations in 1902 as Monsanto. The plant operated from 1902 until 2005. The Queeny plant occupies approximately 63 acres of industrial land in a floodplain located on the west side of the Mississippi River.

Historically, Monsanto produced the herbicide Lasso in the former portion of the plant known as the Acetanilides Production Area. Since the plant's inception in 1902, over 200 products have been produced in over 800 different forms, including chemicals, food additives, and drugs. During the 1960s, the plant expanded to cover 72 acres and employed 1900 full time personnel. By the 1970s, production activities and the number of buildings at the site began to decrease. In 1997, Monsanto spun-off Solutia. Pharmacia has since purchased Monsanto and spun-off the "new" Monsanto as a separate Agriculture Division.

Historically, Solutia had a *Resource Conservation and Recovery Act* (RCRA) Hazardous Waste Management Permit for the storage of hazardous waste in a storage pad area and for the treatment of hazardous waste in an incinerator. Both permitted, RCRA-regulated units were closed in 1994. Solutia identified eight Solid Waste Management Units (SWMUs) and two Areas of Concern (AOCs) that may have contributed to subsurface contamination at the Queeny Facility. Of these, four SWMUs were carried forward and included in the Administrative Order on Consent between the U.S. Environmental Protection Agency (EPA) and Environmental Operations, Incorporated, and are currently being addressed by interim measures.

The primary objective of an Operation and Maintenance (O&M) Inspection Report is to evaluate the methodology, procedures, analytical results, and documentation of the groundwater monitoring program implemented by Solutia at the J. F. Queeny Plant in St. Louis, Missouri.

This O&M Report was prepared as part of Missouri's authorization to administer portions of the federal RCRA. This report evaluates the technical and regulatory adequacy of the Facility's groundwater monitoring program with respect to the regulatory requirements of 40 CFR Part 265 Subpart F. As a result of this evaluation, the Missouri Department of Natural Resources (Department) has determined the following:

1. A Baseline Groundwater Monitoring Plan, the 's Sampling and Analysis Plan (SAP), was received by the Department on October 8, 2010. A review of this document identified some issues that should be addressed by submitting replacement pages.
2. The procedures and techniques being used by the sampling personnel for well purging, sample collection, and for the handling and preservation of the samples were appropriately performed. This O&M Report identified a few procedural issues that the Facility should review and modify in future sampling events.

3. Maintenance and/or repair is needed for some of the monitoring wells and should be completed if they have not already been addressed. The majority of the groundwater monitoring wells at the site appear to be structurally sound and capable of yielding reliable samples.
  4. Accurate potentiometric surface and total well depth measurements are being obtained by the Facility's field personnel during the annual and semiannual sampling events.
- 
5. There was greater than an order of magnitude of difference between the volatile organic compound (VOC) analytical results obtained by the Facility and those obtained by the Environmental Services Program (ESP). The data has some qualifiers (such as dilution, estimation because outside of calibration range and estimation because outside of quality control limits) that could explain some of the differences. Also, differences in analytical methods could account for some of the differences. A comparison to historic data indicated that analytical data collected by the ESP was higher than historic analytical data (2005 O&M) and that the Facility's analytical data was lower than historical analytical data. The Facility may want to reevaluate the analytical results for the constituents with significant differences and the quality assurance/quality control (QA/QC) data from their contract laboratory for the September 6, 2011, sampling event to determine if a specific reason and/or cause of these significant differences can be found.

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**Table 1: List of Acronyms Used in this Report**

<b>Acronym</b>	<b>Definition of Term</b>
AOC	Areas of Concern
APA	Acetanilides Production Area
MGS	Missouri Geological Survey
cm/s	Centimeters per second
cu yds	Cubic yards
DCE	Dichloroethene
Department	Missouri Department of Natural Resources
EPA	U.S. Environmental Protection Agency
ESP	Environmental Services Program
FBCSA	Former Bulk Chemical Storage Area
bgs	Below ground surface
ft/day	Feet per day
ft	Feet
ft/ft	Feet per feet
gpm	Gallons per minute
HASP	Health and Safety Plan
HWP	Hazardous Waste Program
IMWP	Interim Measures Work Plan
LNAPL	Light Non-Aqueous Phase Liquids
MCLs	Maximum Contaminant Levels
ml	Milliliter
MNA	Monitored Natural Attenuation
O&M	Operation and Maintenance
Order	Administrative Order on Consent
ORP	Oxidation-Reduction Potential
PCB	Polychlorinated biphenol
PCE	Tetrachloroethylene
PDBs	Passive Diffusion Bag Samplers
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Investigation
SAP	Sampling and Analysis Plan
SVOCs	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
TOC	total organic carbon
TOX	Total Organic Halides
TSCA	Toxic Substances Control Act
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

## 1.0 INTRODUCTION

### 1.1 Objectives and Scope

The State of Missouri's RCRA program authorization is, in part, contingent upon periodically preparing a review of groundwater monitoring systems and programs at RCRA hazardous waste treatment, storage, and disposal (TSD) facilities. One of these evaluations of groundwater monitoring systems is called a RCRA O&M Inspection.

The primary objective of an O&M is to evaluate the technical and regulatory adequacy of the groundwater monitoring program implemented by a as compared with the groundwater monitoring requirements contained in the applicable RCRA regulations. The applicable RCRA regulations are 40 CFR Part 264 Subpart F for Permitted facilities and 40 CFR Part 265 Subpart F for Interim Status facilities. Each of these RCRA Sections have also been incorporated by reference into and modified by State of Missouri regulations.

The O&M evaluation concentrates on the Facility's ability to operate and maintain the existing groundwater monitoring system and the Facility's proficiency in collecting representative groundwater samples from the monitoring system. The O&Ms are accomplished using a two-step process. The first step is to review the various documents submitted to the Department's Hazardous Waste Program (HWP) by the Facility including:

1. Any monitoring requirements contained in an applicable Missouri Hazardous Waste Management Permit, applicable Corrective Action Order on Consent, Corrective Measures Implementation Plan, Groundwater Monitoring Plans, etc., and whether the is in compliance with these monitoring requirements.
2. Any activities relating to the groundwater monitoring system, inspections, or enforcement actions occurring at the during the period covered by the O&M Report and to identify any subsequent issues or potential concerns with the operation and/or maintenance of the groundwater monitoring program.
3. Whether the 's SAP is sufficient per the RCRA requirements and whether the sampling personnel are following this SAP in practice.

The second step in the O&M process is to perform an on-site inspection to:

1. Visually assess the structural integrity of the existing groundwater monitoring wells at the Facility.
2. Determine if the owner/operator's sampling devices are in proper working order and whether the sampling procedures are adequate with respect to obtaining representative groundwater samples for analysis.
3. Evaluate whether individual monitoring wells and piezometers are yielding reliable groundwater samples and groundwater elevation data.

The Department's HWP is responsible for the preparation of a report based on the results of the O&M. To accomplish the O&M objectives, evaluations of the following are completed:

1. Field measurements of water quality parameters.
2. Piezometric measurement techniques.
3. The techniques used for the measurement, purging, and sampling of monitoring wells.
4. The quality control and preservation procedures used for groundwater samples.
5. The SAP included in the 's current quality assurance project plan (QAPP).
6. Well and equipment maintenance activities and condition.
7. The split sampling results.

At this time there are no Semiannual or Annual Groundwater Reports for this site to evaluate. These reports will be reviewed in future O&Ms. This year the Department is tasked with preparing an O&M Inspection Report for the Solutia J.F. Queeny Plant south of downtown St. Louis, Missouri. There are eight SWMUs and two AOCs that may have contributed to subsurface contamination at the Queeny Facility. Of these, four SWMUs were carried forward and included in the Administrative Order on Consent between the EPA and Environmental Operations, Incorporated, and are currently being addressed by interim measures. These RCRA regulated units are subject to the applicable interim status groundwater monitoring requirements contained in 40 CFR Part 265 Subpart F.

This O&M Report evaluates the adequacy of the groundwater monitoring system and monitoring wells at the site as specified in the above Objectives and Scope discussion. The sampling routines used at the site were observed by Pamilyn Hackler and Ken Hannon of the Department's ESP on September 6, 2011, as part of an inspection that coincided with a regularly-scheduled groundwater sampling event. Physical examination of the groundwater monitoring system at the site was completed by Brenna McDonald of the Department's Missouri Geological Survey (MGS) on August 29, 2011. John Truesdale from Environmental Operations, Incorporated, was responsible for conducting the actual groundwater monitoring activities.

## **1.2 Information Sources**

The following site-specific documents were reviewed in the evaluation of the Facility's current groundwater monitoring program.

1. The most recent O&M Inspection Reports prepared for Solutia, Incorporated, dated December 6, 2005.
2. The Environmental Operations, Incorporated, Baseline Groundwater Monitoring Plan dated October 6, 2010.
3. The O&M Inspection Report for Environmental Operations, Incorporated, as prepared by the Department's MGS on the inspection of the monitoring well network at the site, dated August 29, 2011.
4. The RCRA O&M Sampling Audit Report as prepared by the Department's ESP, dated September 6, 2011.

Additional secondary sources of information, such as local and regional geologic and hydrologic studies and the EPA guidance documents, were also consulted in preparing this report. These information sources are detailed in the References Section of this report.

A chronology of the regulatory compliance history relevant to groundwater monitoring, corrective action, and site/waste characterization at the Solutia Queeny Plant since the O&M conducted in December 2005 is provided as Appendix A of this report. A complete list of correspondence among Solutia, EPA, and the Department can be found in the agencies' RCRA files for Solutia.

## **2.0 SITE DESCRIPTION AND BACKGROUND**

### **2.1 Location and Description**

The former Solutia Queeny Plant is located two miles south of downtown St. Louis, Missouri, at 201 Russell Boulevard. The Facility is located on the west bank of the Mississippi River at River Mile 178 (URS, 2002). The legal description of the is the N ½, NE ¼, SE¼, Section 26, T.45N, R.7E, and S ½, SE ¼, NE ¼, Section 26, T.45N, and R.7E in the Cahokia Quadrangle in St. Louis, Missouri. The Facility occupied roughly 63 acres; of this, approximately 58 acres are contiguous and were used for manufacturing. The remaining 4.6 acres, located south of the main property, comprise the former Bulk Chemical Storage Area and the former Coal Storage Yard. The entire complex is covered either by concrete, asphalt, or crushed stone. An eight-foot tall fence surrounds all Solutia properties with only locked gates for access. Location and site maps are located in Appendix B of this report.

A U.S. Army Corps of Engineers flood wall is located east of the property and protects the from floodwater. According to the Federal Emergency Management Agency (FEMA) the Facility is not located within the 100-year flood plain (URS, 2002). A Union Pacific Railroad switchyard is also located east of the Facility. Numerous commercial and industrial businesses border the Solutia property. A map showing surrounding property is included in Appendix B of this report.

The Queeny Plant was founded in 1901 under the name Monsanto Chemical Works. In 1933 Monsanto Chemical Works changed its name to Monsanto Chemical Company. The company underwent another renaming in 1964 and became the Monsanto Company. Solutia, Incorporated, was formed from a spin-off of the chemicals business of the Monsanto Company on September 1, 1997. Pharmacia has since purchased Monsanto and spun-off the "new" Monsanto as a separate Agriculture Division. Manufacturing operations at the Queeny Plant shut down in the spring of 2005. SWH Investments purchased the Queeny Plant and assumed the environmental obligations for the property effective June 13, 2008. Environmental Operations, Incorporated, in affiliation with SWH Investments II, is assuming the responsibilities for the environmental obligations for the Queeny Plant in order to prepare the property for redevelopment for light industrial and commercial use. Environmental Operations, Incorporated, and the EPA entered into a Corrective Action Order on Consent on September 30, 2009. The AOC is the regulatory mechanism requiring performance of interim measures and implementation of a final remedy at the Facility.

The was established on six acres at its current location in 1901 with the chemical manufacturing of saccharin. Since its inception, the Queeny Plant has manufactured over 200 products using over 800 raw materials. The major products have included but are not limited to: process chemicals such as maleic anhydride, fumaric acid, toluene sulfonic acid, and paranitrophenetole; plasticizers such as phthlate esters and toluene sulfonamides; synthetic functional fluids such as Pydrauls™, Skydrols™, coolanols, food, and fine chemicals such as salicylic acid, aspirin, methyl salicylate, benzoic acid, and ethavan; and agricultural chemicals such as Lasso™ (i.e., acetanilides or alachlor).

The Queeny Plant has evolved with time. During the 1960s the went through several expansions. The acreage of the at its peak was approximately 76 acres with over 1900 employees. By the 1970s, production activities and the number of buildings at the site began to decrease due to a series of sales and consolidations. In 1989 the analgesics business and a nine acre parcel of land was sold to Rhone Polenc (now Rhodia). In December of 1990, production of Lasso™ was halted. In early 1991 trichlorocarbanilide production ceased. In 1993 the maleic anhydride business was sold to Huntsman Specialty Chemicals. In 1995 the manufacture of paranitrophenol ended. In 2005 the Rhodia property was sold to Ted Ahrens. A special warranty deed was placed on this property restricting the property use to non-residential, prohibiting the use of groundwater, and providing easements to the property of the proposed corrective action.

Prior to the shutdown and dismantling of the (spring 2005) the Queeny Plant produced four major products and had 95 employees. The ran batch chemical processes to produce, blend, package, and repack organic chemical products. Products included: L-aspartic acid and a nonessential amino acid used in artificial sweeteners, was produced in the YY Building; Skydrol™ fire resistant hydraulic fluids used in the airline industry were blended and repackaged in the VV Building; maleic anhydride briquettes produced by Huntsman Corporation; and Duralink™, a high temperature stabilizer used in the manufacture of rubber tires by the Flexsys joint venture in the PA building (URS, 2002).

As part of its ongoing efforts to control and remediate hazardous substances from the Facility, Solutia removed all underground storage tanks from service. Solutia also removed all polychlorinated biphenyl (PCB) sources, implemented a groundwater protection plan and dismantled all idle facilities.

## 2.2 Regulated Unit Description and Monitoring Status

The Queeny Plant contained eight SWMUs and two AOCs that have been addressed in the corrective action program and all but four have been assessed as requiring No Further Action per EPA's Resource Conservation and Recovery Act Facility Investigation (RFI) responses. These four sites are: the VV Building area, the former FF Building Area, the former Acetanilides Production Area, and the former Bulk Chemical Storage Area. Of these four SWMUs, three of them require groundwater monitoring, the former FF Building Area, the former Acetanilides Production Area, and the former Bulk Chemical Storage Area.

**VV Building Area.** VV Building area served as the production area known as "Central Drumming." The building has been removed, with the floor slab currently in place. The area encompassed approximately 150 feet (ft) by 225 ft. Activities at this location involved the unloading and bulk storage of a wide variety of liquid materials and the repackaging of these materials or a blend of these materials into smaller quantities (i.e., quarts, gallons, 5-gallon, and 55-gallon containers). The identified SWMU area associated with VV Building involves a railcar unloading area where Aroclors (i.e., PCBs) were unloaded and pumped into storage prior to repackaging for shipment. This area is primarily paved, with some of the area being covered with gravel and a rail spur. The primary constituents of concern in this area are PCBs in soil.

In 1993 Monsanto replaced a section of track along the eastern side of the VV Building. In the routine testing of soil for appropriate disposal, the soil was found to contain from 15 to 150 mg/kg PCB. Approximately 40 cubic yards (cu yds) of soil were removed and transported to a toxic substances control act (TSCA) approved landfill for disposal. In 2004 repairs were made to a water line in the northern portion of this area. The excavated soils were found to contain PCBs. Approximately 150 cu yds of excavated soil were removed and transported to a TSCA-approved landfill for disposal. After water line repairs were made, the excavation was backfilled with clean fill and the surface repaved with concrete. Subsequent sampling has indicated soil impacted with PCBs remains at this SWMU. Additional PCB contaminated soil was removed at the VV Building as part of the interim measures required under the AOC. During the interim measures a total of 2500 tons of PCB contaminated soil was removed from the VV Building Area: 1000 tons from the southern portion and 1500 tons from the northern portion.

**Former FF Building Area.** The area associated with the FF Building that constitutes the SWMU includes the footprint of the former building (an area of approximately 150 ft by 75 ft) and the surrounding area including a former underground storage tank. The ground covering in this area is asphalt, crushed, and compacted stone. This area is currently not used and no buildings are located in the area.

The FF Building was a production unit used for the manufacture of trichlorocarbanilide, a bacteriostat used in body soap. Production of TCC began at the Queeny Plant in 1951 and in early 1991 operations ceased and the was dismantled. One of the raw materials used in the production of trichlorocarbanilide was tetrachloroethane (PCE), which was stored in an underground storage tank that has since been removed. PCE was recovered during several months (in 1987) of operating four recovery wells (REC-1 through REC-4) which were constructed with screened intervals penetrating the top of the bedrock. The light non-aqueous

phase liquid (LNAPL), comprised mostly of toluene, was also found beneath an area north of the former FF Building. The LNAPL covered a relatively small area surrounding monitoring well LPZ-4.

Interim measures include injection of RegenOx™ and ORC Advanced™ at 17 locations at depths of 7 to 17 ft below ground surface (bgs). RegenOX™ and ORC Advanced™ along with 3B micro Emulsion® and BioDechlor Inoculum® Plus were injected at 15 locations at depths of 15 to 25 bgs and at 6 location at depths of 50 to 60 bgs. Additional interim measures will include continued groundwater monitoring and one to two additional rounds of injection activities.

**Former Acetanilides Production Area (APA).** The APA produced acetanilides or Alachlor also referred to as Lasso™, and it is located in the south-central portion of the Queeny Plant. The estimated size of this manufacturing block is 300 ft by 450 ft. This production area began operations in 1966, as a multi-product. The Lasso™ operations ceased in 1991. The ground covering in this area consists of buildings, asphalt, concrete foundations of former aboveground storage tanks (ASTs), and railroad ballast near the railroad spur.

Based on subsurface investigation conducted in this area, several constituents used in the Lasso production (notably chlorobenzene and alachlor) were found to have leaked into the subsurface. Previous groundwater impacts identified through groundwater analyses also indicated that chlorobenzene and alachlor were at soluble limits. Thus, potential source areas for LNAPL and residual LNAPL material that remain in the subsurface and contribute to groundwater impacts.

Interim measures include injection of RegenOx™ and ORC Advanced™ at 30 locations at approximately 5 ft above bedrock. Fourteen additional locations received ORC Asvance™ only. Additional interim measures will include continued groundwater monitoring and one to two additional rounds of injection activities.

**Former Bulk Chemical Storage Area (FBCSA).** The FBCSA approximates a parallelogram shaped parcel of land approximately 285 ft by 300 ft, or approximately 1.94 acres. The FBCSA is located outside of the main property and site security fence, but is enclosed by a locked security fence. It was purchased by Monsanto in 1968 from Clark Oil Company and included two 500,000 gallon ASTs and two 300,000 gallon ASTs that were used by Clark for fuel storage.

After the 1968 purchase, raw materials used at the Queeny Plant were unloaded from a barge terminal, located on the west bank of the Mississippi River, and pumped into these tanks for storage. Materials stored at the terminal by Monsanto and others included: petroleum products, alkyl benzenes, blends of alkyl benzenes (Purex A-220 and Canadian A-221), Sanitizer 154 plasticizer (p-t-butylphenyl diphenyl phosphate), monochlorobenzene, ortho-nitrochlorobenzene, sodium hydroxide, and potassium hydroxide. The use of this area was discontinued in 1987 and the tanks were removed. This area has at times been leased to other companies as open space storage.

The ground covering in this area is asphalt, crushed, compacted stone, and sparse volunteer vegetation. Based on previous investigations, a variety of constituents appear to have leaked into the subsurface from tanks or pipes leading into and out of the tanks. Specific investigations were undertaken to identify the extent of soil impacts and the extent of LNAPL and residual LNAPL materials. Based on these investigations, there are several areas where LNAPL has been observed. A sample of LNAPL from former piezometer FBSCA-PZ-5 indicates that the LNAPL is composed primarily of chlorobenzene, benzene, and ethylbenzene.

Interim measures include injection of RegenOx™ and ORC Advanced™ at 55 locations at depths of 5 to 45 ft bgs. Additional interim measures will include continued groundwater monitoring and one to two additional rounds of injection activities.

### **2.3 Description of Monitoring Well Systems**

The current network of groundwater monitoring wells at Solutia was constructed during numerous phases of groundwater investigations. Twenty-eight groundwater monitoring wells were installed as part of preliminary investigations in 1983 and 1984. Thirteen monitoring wells and four dense non-aqueous phase liquid (DNAPL) recovery wells were installed in 1988 as part of the Building FF, Acetanilides Production Area, and Coal Storage Yard investigations. The Phase I RFI investigation in 1992 resulted in the installation of five groundwater monitoring wells, one 8-inch diameter test well, and a 4-inch diameter observation well. In the summer of 2000, Solutia completed an additional 13 monitoring wells as part of the RFI Data Gap Investigation. Solutia has reported that 16 of the wells have been closed, though no abandonment information has been documented. Additionally, Wells GM-4 and GM-5 have been paved over and "lost." Environmental Operations, Incorporated, installed an additional nine monitoring wells: Groundwater monitoring wells MW-32A, MW-33, MW-39A, and MW-39B were installed in August 2011; and groundwater monitoring wells MW-36A, MW-36B, MW-38A, and MW-38B were installed in March 2012.

The planned baseline groundwater monitoring network of 47 wells includes background wells, source area wells, and down-gradient wells within and along the plume boundaries. The groundwater wells monitor three different units: the fill and Silty Clay Unit, the Sand Unit, and the Bedrock Unit in three SWMUs.

In the former FF Building Area monitoring wells MW-2B and MW-39A are background wells for the Fill and Silty Clay Unit. Monitoring wells MW-3, LPZ-2, LPZ-4, and LPZ-5 are source area wells within the Fill and Silty Clay Unit. MW-28A, MW-30A, MW-36A, and MW-38A are down-gradient wells in the Fill and Silty Clay Unit.

The Sand Unit at the former FF Building Area has MW-2A and MW-39B as background wells; REC-1 and REC-4 as source area wells; and MW-28B, MW-30B, MW-36B, and MW-38B as down-gradient wells.

The bedrock wells at the former FF Building are source area wells OBW-1 and OBW-2 and down-gradient well OBW-3.

In the FBCSA, HW-2 is a background well; VW-1, VW-2, MW-24A, MW-25A, and FBCSA MW-5 are source area wells; and MW-32A and MW-33A are down-gradient wells in the Fill and Silty Clay Unit.

The Sand Unit of the FBCSA has HW-1 as a background well; MW-2, MW-24B, and MW-25B as source area wells; and MW-31B, MW-32B, MW-33B, and MW-34B as down-gradient wells.

In the former APA, MW-15 is the background and down-gradient well; GM-1 and GM-2 are source area wells; and MW-4, MW-5, MW-9, MW-11A, MW-13, MW-19, and MW-23 are down-gradient wells in the Fill and Silty Clay Unit.

### **3.0 ENVIRONMENTAL SETTING**

#### **3.1 Regional Characterization**

##### **3.1.1 Regional Geology**

The State of Missouri north of the Missouri River lies in the physiographic province classified as the Central Lowlands. The Ozark Plateau province lies south of the river, such that the city of St. Louis is geographically situated on the northeastern edge of the Ozark Plateau. St. Louis is situated on a monoclinical structure that is dipping to the northeast. This structure has additional associated features, including anticlines, synclines, and at least one fault. The St. Louis Fault is the nearest bedrock structure and is located 1.5 miles to the west. This vertical fault strikes N. 5° E. and has a net offset of 10 ft. The Solutia site is on the down-thrown side.

Additional structural features include the Cheltenham Syncline, Eureka-House Springs Anticline, and the Dupo-Waterloo Anticline. The axis of the Dupo Anticline lies 2 miles east of the Solutia site. The Dupo Anticline strikes north-northwest and has a gentle slope on the east side and a steeper slope on the west side. This anticline has a history of natural gas production as well as a small amount of oil.

Mature karst topography has developed behind the bluffs on the major rivers where carbonates make up the bedrock just below the surface. Coalescing sinkhole fields, losing streams, and an extensive cave network are all present in upland areas where the bedrock is composed of soluble Mississippian limestone. Karst features are not as prevalent beneath areas covered with relatively insoluble Pennsylvanian-age shale and clay. The nearest notable karst feature to the Solutia site is a sinkhole in Lafayette Park located approximately 1.25 miles west-northwest of the site. Other sinkholes may be closer to the site, but their presence has been obscured by development.

##### **3.1.2. Regional Stratigraphy**

Surficial materials in the St. Louis area consist of fill, alluvial deposits, and glacial materials. The glacial materials are expressed as till consisting of silt and clay with some gravel that tend to be very stiff. These materials may possibly be derived from loess or glacial lake deposits. The recognizable glacial materials generally occur along the Missouri, Mississippi, and Meramec

Rivers. Most of the surface soils in southern and southwestern portions of the St. Louis area are formed from limestone residuum or from the loess.

The following is a description of the bedrock stratigraphy in the St. Louis Area as described in the book *"The Stratigraphic Succession in Missouri"* (1961), the *Comprehensive Groundwater Monitoring Evaluation, Solutia -Queen, St. Louis Missouri* (DNR, 2001), and *RFI Data Gap Investigation Report* (URS, 2002).

The St. Louis Limestone formation of the Paleozoic Era, Mississippian System Meramecian Series is the first competent bedrock below the site (approximately 90 ft thick). It is a very hard light yellow to grayish rock, mostly pure carbonate but may contain some gray, breccia beds, and dolomite pseudo-concretions. The Salem formation underlies the St. Louis limestone. The Salem formation (approximately 140 ft thick) is a white to blue-gray, argillaceous, locally oolitic, and cross-bedded limestone. A distinctive "bulls-eye" chert nodule zone occurs near the top of the Salem formation and indicates the approximate contact with the St. Louis limestone. The Warsaw formation underlies the Salem formation. The Warsaw formation (approximately 110 ft thick) is buff to gray, argillaceous limestone interbedded with green calcareous shale.

The Burlington-Keokuk Limestone Undifferentiated Formation is the uppermost formation of the Mississippian System Osagean Series and is conformably overlain by the Warsaw formation of the Meramecian Series. The Burlington-Keokuk Limestone Undifferentiated Formation (approximately 155 ft thick) is coarse grained, white to brownish-gray, cherty, crinoidal, massive limestone. The Fern Glen Formation underlies the Burlington-Keokuk Limestone Undifferentiated Formation. The Fern Glen Formation (approximately 60 ft thick) is a gray-green to red, fossiliferous, thickly bedded limestone with the upper portion of the formation being cherty. A thin red shale marks the bottom of the Fern Glen Formation. The undifferentiated Chouteau Group of the Kinderhookian Series underlies the Fern Glen Formation and forms the basal unit of the Mississippian System. The Chouteau Group (approximately 40 ft thick) is made up of discontinuous limestone and rests unconformably on top of the Devonian System.

The Devonian System is represented by the thin presence of the Grassy Creek Shale. The Grassy Creek Shale (3 to 20 ft) is a gray-black, fissile, carbonaceous shale. The Grassy Creek Shale rests unconformably on the undifferentiated Silurian dolomite. The Silurian dolomite (40 to 120 ft thick) is silty and contains some small amounts of chert.

The Silurian dolomite rests unconformably on the Ordovician-age Maquoketa Shale. The Maquoketa Shale (approximately 140 ft thick) is a blue-gray, often calcareous, platy shale. Below the Maquoketa Shale are over 2500 ft of Cambrian and Ordovician-aged limestone, dolomite and sandstone that comprise the Ozark Aquifer. The Maquoketa Shale forms an important upper confining unit for the underlying Ozark Aquifer.

### 3.1.3. Regional Hydrology

Regionally, groundwater in St. Louis City flows from west to east towards the Mississippi River. The quantity of groundwater available for production in St. Louis City varies with depth and location. Large amounts of fresh water are stored in the bedrock and alluvium, although the alluvial aquifers are generally more productive than the bedrock aquifers. Alluvial wells can produce water up to a rate of 1000 gallons per minute (gpm). Shallow bedrock wells, with completion depths less than 300 ft, generally yield 10 to 15 gpm. However, deeper bedrock wells with completion depth deeper than 500 ft bgs can produce between 50 to 465 gpm.

Groundwater quality also varies greatly with depth and location. Shallow groundwater from wells completed in Pennsylvanian-age bedrock generally has a higher content of dissolved solids than groundwater from wells completed in alluvium or the deeper Mississippian, Ordovician, and Cambrian bedrock. All shallow sources of groundwater are subject to surface and near-surface contaminant sources due to the presence of sinkholes, fractures, and enlarged bedding planes that allow surface water to enter the shallow aquifers.

Based on a review of the region on behalf of the EPA in 1989, it was determined that no drinking water supply wells exist within a one-mile radius of the Queeny Plant. Solutia's water supply comes from the City of St. Louis, whose source is the nearby Mississippi River. There are two city water supply intakes near Solutia; one 1.5 miles upstream to the north and another 5 miles upstream to the north. The nearest downstream water intake is 68 miles to the south in Chester, Illinois.

## 3.2 Site Characterization

The site area is considered to be part of the Mississippi River floodplain. A significant amount of development has occurred over the past 200 years and the associated filling activities have raised the ground surface elevation and extended it eastward. This increased ground surface elevation and area, combined with the floodwall, which is immediately east of the property, has shifted the eastern edge of the flood plain east of the site (URS, 2002). The surficial fill material consists mainly of clay, silt, sand, and debris. Underlying the surficial fill are glacial, alluvial, and colluvial deposits. The glacial material generally consists of gravel, sand, and silt, which are very dense to hard, originating as colluvial-fluvial materials deposited by melt-waters. The alluvial and colluvial deposits consist of interbedded sand, silt, and clay that were laid down on top of the glacial deposits by the current Mississippi River. Colluvial deposits were deposited concurrently with alluvial deposition at the flood plain margin. The general grain-size of alluvial-colluvial deposits above the bedrock becomes coarser with depth, from clay to sand. Four stratigraphic units have been identified beneath the Facility: fill, silt and silty clay, sand, and bedrock.

### 3.2.1. Surface Materials

Fill is the most extensive and continuous overburden unit, with thickness ranging from 2 to 32 ft in the northern portions of the site. The fill material is comprised of both native alluvial soils and non-native debris such as ash, cinders, bricks, glass, pottery, construction debris, coal fines, and gravel. In the former Lasso production area, the fill was noted to contain chat. In the quarry area, the mined rock has been replaced with over 100 ft of fill material. The quarry walls are thought to be nearly vertical extending up 100 ft to an elevation of 400 ft above mean sea level (AMSL). Fill in the former coal yard is overlain with 2 ft of a coal layer.

Below the fill, across most of the site, is a relatively lower permeability fine-grained alluvial silt and clay unit with some areas of clayey silt and interbedded sand seams. The silty clay is absent in some areas across the site, predominately in the former Quarry Area where the overburden was removed during the quarrying of the underlying limestone. The silty clay is generally a mixed gray to brown to yellow in color. The thickness ranges from 4 to 10 ft thick at the bedrock high and can be 30 ft or greater in the northern and southern portions of the site. The sand seams are usually water saturated and generally appear to be physically and hydraulically isolated.

In the northern and southern portions of the site a sand unit underlies the silty clay and extends to bedrock. The sand is absent in the central portion of the site where a bedrock high exists. On the bedrock high, the silty clay directly overlies the bedrock. The sand unit in the northern portion of the site consists of a light brown to grayish brown, moist to wet, fine- to medium-grained sand. This sand unit varies in thickness between 50 and 60 ft before it thins to the south, southwest, and southeast towards the bedrock high in the middle of the site. Sand in the southern portion of the site, near the coal storage yard and bulk chemical storage area, is an olive gray, brown, or tan, moist fine-grained sand unit that grades downward to a more coarse-grained sand. This sand unit varies in thickness from 22 ft to 53 ft.

### 3.2.2. Bedrock Formations

The upper bedrock identified at the Solutia site is a limestone from the St. Louis Formation of the Meramecian Series. The limestone is described in boring logs from the as finely to coarsely crystalline, fractured, and weathered. Fractures may be filled with clay or secondary mineralization.

The bedrock surface is uneven with a topographic high near the center of the site and lows in the north and south. The bedrock surface generally slopes to the east towards the Mississippi River. The northern bedrock low near monitoring well MW-2 may reflect a former erosional stream channel. In the area of the bedrock high the shallowest depth to bedrock is less than 10 ft. Away from the bedrock high, the depth to bedrock is as much as 91 bgs. In the southeastern portion of the site, a former limestone quarry extended to over 100 bgs. The quarry has since been filled.

### 3.2.3 Site Hydrogeology

Groundwater at Solutia is encountered within three major water bearing zones: fill and silty clay, sand, and bedrock. Local groundwater flow and direction at Solutia is influenced by the bedrock high noted in the central portion of the site. The shallow groundwater in this area generally flows radially away from the bedrock high and then turns back east toward the river away from the bedrock high. The upper most zone is within the fill and silty clay that together covers the entire site. The majority of the water in this zone is contained within the various sand lenses encountered in the silty clay, however, there are some zones of granular material in the fill that yield water. The sand unit represents the major groundwater migration pathway due to its hydraulic properties (i.e., relatively thick and permeable). Groundwater in the bedrock unit is believed to generally flow east toward the Mississippi River. The primary flow path is considered to be through secondary porosity features in the bedrock, which could include fractures, joints, bedding planes, or solution cavities.

Infiltrating precipitation is expected to migrate downward into the fill and silty clay and further downward into the sand units. The groundwater in wells screened within the fill and silty material is typically found at 6 to 10 bgs. With the absence of any significant sandy alluvium in the center of the site, shallow groundwater appears to migrate radially away from the bedrock high near the former Lasso™ production area prior to migrating more towards the Mississippi River. Groundwater originating north of the bedrock high appears to migrate towards the northwest and down into the sand prior to migrating east toward the Mississippi River. In the southern portion of the , groundwater flow direction appears to be towards the southeast.

Slug tests were performed on various wells and the potential communication between the groundwater within the fill and silty clay unit and the river was evaluated. These tests which effectively measure the most permeable material in the screened zone produced hydraulic conductivity values of  $5.1 \times 10^{-5}$  to  $1.1 \times 10^{-1}$  centimeters per second (cm/sec) for the fill and silty clay. The more permeable granular material in the fill or sandy lenses in the silty clay influence these higher values. In addition, negative or only minor communication between the groundwater in the fill and silty clay and the river was identified (OBG, 1999). As such, they do not represent a significant groundwater migration pathway to the river. At nested well locations, comparison of the potentiometric surface between wells screened in the fill and silty clay with those screened in the underlying sand shows a downward vertical gradient. Therefore, the thin lenses of permeable material in the fill and silty clay unit are isolated and do not exhibit significant direct communication with the river, but primarily serve as a connective media with the underlying sand.

Calculated groundwater flow gradients in the fill range from 0.004 feet per foot (ft/ft) to 0.011 ft/ft and calculated velocities ranged from 0.89 to 1.57 feet per day (ft/day). In the silty clays, the hydraulic gradient was calculated in a range from 0.006 to 0.009 ft/ft. Calculated velocities ranged from 0.007 to 1.013 ft/day.

The entire thickness of the sand unit is generally confined with depths to water ranging from approximately 17 ft to 35 ft bgs. The unit is confined by the overlying silty clay. The groundwater flow direction in the sand is generally east, toward the river. Slug tests and pump tests conducted at the site produced hydraulic conductivity values of  $5.6 \times 10^{-2}$  cm/sec for the sand

located north of the bedrock high, which is within the anticipated range. In addition, evaluation of the communication between the sand unit and the river showed a positive relationship between river stage and groundwater elevation (OBG, 1999). The hydrogeological properties are believed to be similar in the sand to the north and to the south of the bedrock high. A comparison of the potentiometric surface in wells screened at different depths in the sand unit shows very little vertical component, which indicates that flow is generally horizontal. This indicates that the sand unit is the primary pathway for offsite migration and suggests that if any communication with bedrock exists, it does not induce a vertical gradient within the sand unit. In the sands, hydraulic gradients ranged from 0.001 to 0.02 ft/ft and velocities from 3.94 to 5.25 ft/day.

Groundwater flow in the bedrock is typically through fracture, joint, bedding plane, and solution cavity systems and therefore does not have the same characteristics as porous media flow (as in the sand or silty clay). The flow direction in the bedrock is largely influenced by the orientation of corresponding fractures, joints, bedding planes, etc., in addition to recharge from or discharge to the river and the driving head of groundwater. Depth to groundwater in bedrock wells resembles depths in nearby sand wells, ranging from 10 ft to 33 ft bgs. Closer to the river, bedrock wells have potentiometric surfaces that are slightly higher than adjacent wells screened in the sands.

Seven monitoring wells are screened in bedrock, including monitoring wells MW-2R, MW-8R, MW-13R, MW-21R, OBW-1, OBW-2, and OBW-3. Monitoring wells MW-2R, MW-8R, OBW-1, and OBW-2 are bedrock wells where the top bedrock is above the local sand unit. Monitoring wells MW-2R and MW-8R are located along the eastern perimeter of the site and have associated Wells MW-2B and MW-8B screened in the sand. Comparison of water levels in these wells show an upward hydraulic gradient. Monitoring wells OBW-1 and OBW-2 do not have associated wells screened solely in the sand.

Monitoring wells MW-13R, MR-21R, and OBW-3 are located on the bedrock high where the sand unit is absent. The bedrock in this area is overlain with the fill and silty clay units. Well MW-13R has an associated shallow well MW-13. Water levels in these wells suggest a downward gradient. Monitoring well OBW-3 is located near Well MW-9, which is screened in the fill/silty clay unit. Water levels reported for these two wells suggest a downward hydraulic gradient. Monitoring well MW-21R is located in the bedrock high and there are no shallow wells in the vicinity of this well.

These results suggest that flow near the bedrock high area is vertically downward from the fill and silty clay to bedrock and as the distance away from the bedrock high increases, there is a reversal in the vertical direction of flow and flow is from bedrock to the sand unit. Horizontal groundwater flow in the upper limestone bedrock appears to be east-northeast toward the Mississippi River under an approximate hydraulic gradient of 0.007 ft/ft.

## **4.0 OPERATION AND MAINTENANCE INSPECTION**

The primary objectives of this section are to determine if:

1. The Facility's subsurface measurement procedures and groundwater analysis protocols are capable of yielding reliable, consistent and representative hydrologic, and contaminant concentration data.
2. The Facility's evaluation of the hydrologic data adequately represents the site hydrology and if the groundwater monitoring program is capable of detecting the rate and extent of any contaminant movement at the site.

In order to achieve these objectives, Ms. McDonald of MGS conducted a field inspection of the monitoring well network for physical condition, observed the well purging activities of the Environmental Operations, Incorporated, sampling team, and obtained water level measurements from selected wells on August 29, 2011. This MGS field inspection involved examining the monitoring wells for physical integrity with regard to surface seals, inner and outer casings, and general well condition. The water level measurements were collected to compare the static water levels in two regularly-sampled wells at the site. Mr. Truesdale from Environmental Operations, Incorporated, was in attendance during the MGS inspection.

In addition to the MGS inspection, a field inspection to observe and assess the sampling equipment, methods and procedures used by the Facility to collect groundwater samples was conducted by Ms. Hackler and Mr. Hannon of the ESP on September 6, 2011. Mr. Truesdale from Environmental Operations, Incorporated, was responsible for collecting the groundwater samples. Five split groundwater samples and one duplicate sample were collected from the site during this field inspection for analysis by the ESP laboratory and a contract laboratory and for comparison with the analytical results obtained by the Facility's laboratory.

### **4.1 Review of Groundwater Sampling and Analysis Plan**

A SAP is written documentation detailing the overall operation of the groundwater monitoring well system and data collection methods at a site. Each plan should document the procedures used in collecting groundwater samples from the monitoring wells and in the analysis of these samples such that these procedures are done in a proper and consistent manner regardless of the personnel involved. A SAP should be available to field personnel at all times including any contractors performing groundwater monitoring tasks for the Facility. Field personnel should be thoroughly familiar with the contents of a site-specific SAP and are responsible for strict adherence to the procedures specified in the SAP when collecting groundwater samples at a site.

The Department believes a SAP should include an adequate level of detail to accommodate all issues that might affect the quality of groundwater samples and the proper management of those samples. The Department also believes a SAP should include sufficient detail to be able to serve as a complete guide to a new sampling team. The HWP has developed a SAP Worksheet (Appendix D) that outlines the technical requirements that are typically expected and/or desired to be included in a good quality SAP.

The Department received a Baseline Groundwater Monitoring Plan on October 8, 2010, and referred to a Health and Safety Plan (HASP) that was included in the Interim Measures Work Plan (IMWP). The SAP was reviewed to determine the adequacy of the described sampling procedures to provide representative samples and to meet other provisions of sampling procedures toward meeting the regulatory requirements of 40 CFR Part 265 Subpart F. A SAP Worksheet was prepared based on the 2010 SAP as a part of this O&M Report and a copy of the completed worksheet can be found in Appendix D.

Review of the Facility's current SAP determined that the document contains almost everything the HWP expects in a good quality SAP. However, the review did identify several minor issues, detailed below. We request that the Facility consider submitting replacement pages to update the SAP to the current site conditions and sampling procedures.

1. The SAP should be updated to include specific container/cap type for each analytical method, the volume of each type of sample container, and the maximum parameter-specific holding time.
2. The laboratory QA/QC should include verification, validation, and reporting of analytical data (percent recoveries for spiked samples, analytical detection limits, raw analytical data, and calculations, etc.).
3. The SAP should include a HASP. The SAP refers to a Health and Safety Plan as part of the Interim Measures Work Plan (IMWP). Ideally this information should be located with the SAP, because it is intended as a guide to those performing groundwater monitoring. Specific HASP items needed in the SAP as recorded in the SAP Worksheet include: special sample handling requirements, periodic medical monitoring for personnel, a field emergency contingency plan, level of required personal protective equipment, the telephone numbers and location of emergency facilities, field personnel training requirements/documentation, and physical/chemical hazards discussion.
4. The SAP discussion of routine well inspections and maintenance procedures does not include other procedures for periodically assessing subsurface casing integrity (i.e. gauge ring, caliper logs, down well video logging) or provisions for repair/replacement of wells if indicated.

#### **4.2 Physical Integrity Inspection of Monitoring Wells**

Ms. McDonald of the Department's MGS in conjunction Mr. Truesdale from Environmental Operations, Incorporated, conducted a field inspection of 35 monitoring wells associated with the groundwater monitoring network at the site on August 29, 2011. Thirty-two of the wells were above-ground completions with the remaining 3 wells being flush mounted completions. The following activities were performed during this inspection.

1. A visual inspection of each monitoring well was conducted to evaluate the physical integrity of the wells with regard to surface seals, inner and outer casings, and general condition of the well.

2. The static groundwater elevation was measured in two regularly-sampled monitoring wells.
3. Photographs were taken of each monitoring well that was inspected.

A Measurement, Purging and Well Integrity Worksheet detailing the field inspection of the wells was completed by the MGS. A copy of the complete MGS Worksheet and copies of the pictures taken during the inspection are provided in Appendix E. The following discussion presents an evaluation of the observations, comments, and findings documented by the MGS during the field inspection.

The MGS inspection revealed that most of the well completions were in good condition with respect to visible portions of the wells including structurally sound surface seal, risers, protective casings, and locking mechanisms to restrict access. The MGS inspection report cited the following observations regarding the physical integrity of the wells at the site.

1. There are no visible surface seals on 8 monitoring wells (MW-2A, MW-2B, MW-2R, MW-19, OBW-1, VW-1, VW-2, and VW-2B). There are cracked and/or deteriorated surface seals at 4 monitoring wells (MW-3, MW-11B, MW-14, and OBW-2).
2. The protective casings are damaged or do not operate properly at MW-2A, MW-11B, and GM-2. There are four wells with damaged bolsters (MW-2A, MW-3, MW-4, MW-11B). There are three monitoring wells that are not protected by bolsters (HW-1, MW-2B, and MW-31B). These bolsters may protect monitoring wells from being damaged.
3. The wood concrete forms are still attached to the surface seals of three wells (HW-1, MW-24A, and MW-24B) and may allow surface water to pool around the surface completion of the well.

If not already repaired, the preceding issues should be investigated prior to the next groundwater sampling event. Documentation of any repairs should be provided in the next Annual Report submittal.

#### **4.3 Water Level and Total Well Depth Measurement Audit**

During the MGS field inspection, Ms. McDonald of the Department's MGS obtained static water levels from two regularly-sampled monitoring wells at the site. The Facility's consultant also measured the static groundwater levels for these same wells.

The MGS used a 300 foot Solonist model number 12668 water level meter to measure static water levels in each well with these readings recorded to the nearest 0.01 foot. The water level probe was decontaminated between wells by immersing it in a five gallon bucket of Alconox and water, followed by a deionized water rinse. However the probe was not rinsed during the morning.

These static water levels were measured to compare the down-well measurement techniques between the MGS and the Facility and to verify that the Facility is obtaining accurate readings.

The readings taken by MGS and the Facility along with a comparison of these measurements are provided in the following table.

**Table 2: Water Elevation/Total Depth Measurements Comparison of Results**

Well ID Number	Depth to Water (Feet)			
	MGS		Difference <sup>1</sup>	Percentage Difference <sup>2</sup>
MW-39A	13.51	13.52	-0.01	0.07
MW-39B	12.18	12.19	-0.01	0.08

Note 1: The Difference was calculated by subtracting the 's reading from the MGS reading.

Note 2: The Percentage Difference was calculated by taking the absolute value of the Difference for each well, dividing by the MGS reading, and multiplying by 100.

The Facility's measurements are slightly deeper than the corresponding MGS measurements. The preceding table shows the measurements between the MGS and the Facility are generally in close agreement and supports the conclusion that the down-hole measurements being obtained and reported by the are reasonably reliable and accurate.

#### **4.4 Audit of Field Sampling and Analysis Procedures**

Ms. Hackler and Mr. Hannon of the Department's ESP conducted a field audit of the sampling procedures used by the 's sampling team on September 6, 2011, during the regularly-scheduled groundwater sampling event. The RCRA O&M Sampling Audit Report provided in Appendix F details the observations and comments on the well purging techniques used by the Facility's sampling team during the sampling event.

During the audit, the ESP observed the sampling and analysis procedures used by the Facility's sampling team to collect groundwater samples from the following five monitoring wells: LPZ-5, OBW-1, REC-4, MW-24B, and MW-24A. The ESP conducted the following activities during this field inspection:

1. Observed and recorded the physical properties of water evacuated from the wells.
2. Recorded the 's measurement of pH, temperature, and specific conductance, dissolved oxygen and oxidation-reduction potential field parameters of water evacuated from the selected wells.
3. Measured the pH, temperature, specific conductance field, turbidity, dissolved oxygen, and oxidation-reduction potential field parameters from the selected wells.
4. Observed the 's sample handling and preservation procedures.
5. Collected split groundwater samples from the selected wells.

The Facility's sampling team evacuated the monitoring wells with a low flow method using a GeoTech GeoPump 2 peristaltic pump, the tubing through the pump was MasterFlex flexible tubing, and the withdrawal tubing was one-eighth inch polyethylene tubing. Evacuated water that was not used for sampling was placed in five gallon buckets and then transferred to a waste drum on site. The drum will be picked up by a hazardous materials contractor when full (the contractor changes periodically).

After each purge volume at a well, the Facility personnel measured the pH, specific conductivity, temperature, oxidation-reduction potential, and dissolved oxygen of the groundwater using the following equipment: a YSI, Pro ODO, number 09H101046 and Ex Stik II, number 160293. The calibrated the instruments at the beginning of each day.

The Environmental Operations, Incorporated, sampling personnel sampled five groundwater monitoring wells during ESP's visit. Each well used the same peristaltic pump to remove the groundwater. Field measurements for pH, temperature, oxidation-reduction potential, percent and absolute dissolved oxygen, and specific conductivity were taken on all five wells by the personnel and ESP. Additionally, ESP acquired turbidity measurements on the purge and sample water. Facility personnel used a flow-through cell to determine field measurements and the ESP utilized a cup to determine a discrete field measurement.

Sample collection was performed using the same apparatus used in well evacuation. Sample containers were filled directly from the sampling apparatus to the sample containers. Samples were taken in proper procedural order by the ESP with VOCs first, dissolved gasses second, total organic carbon (TOC) third, sulfide fourth, nitrate fifth, and then filling one Nalgene liter container for alkalinity, total dissolved solids, chloride, and sulfate. The Facility personnel were mistaken in the analysis for which the bottles were labeled, although personnel believed they were filling TOC third and dissolved metals last, the was collecting dissolved metals samples third and TOC last.

All the sample containers used by the Facility to collect groundwater samples in September 6, 2011, supplied by the contracted lab, it is unknown if they pre-cleaned the containers. The volatile organic analysis (VOA) sample containers were three 40 milliliter (mL) Teflon septum clear glass vials. The total organic carbon sample analysis container was a 250 mL amber bottle preserved with sulfuric acid. The samples collected for dissolved gasses were collected in three 20 mL Teflon septum clear glass vials. The samples collected for Sulfide was collected in a 250 mL Nalgene bottle preserved with Zinc Acetate and sodium hydroxide. The samples collected for dissolved iron and manganese were collected in a one liter Nalgene bottle.

The split samples were collected by alternatively filling the Facility and the ESP containers from the tube connected to the peristaltic pump. The ESP collected samples in descending order of parameter volatilization (i.e., VOA before metal containers). The Facility; however, collected some samples out of order, by mistakenly confusing TOC sampling container for the dissolved iron and manganese container.

Sample containers were not labeled. The 's sampling personnel labeled a resealable plastic bag with the well number and placed the unlabeled container in the plastic bag. The chain of custody was included in the packet from Pace Analytical Laboratory but was not filled out, while the ESP was present. All samples remain on ice in the custody of the sampling personnel until being

picked up by the contract laboratory. Custody is transferred to the driver or the cooler is custody sealed for transport. The uses Pace Analytical, an off-site contract laboratory, to analyze their groundwater samples.

New tubing was used at each well with the peristaltic pump. The only piece of equipment requiring decontamination was the water level instrument, which is dipped in Alconox solution and then rinsed with distilled water.

The ESP and the Facility sampling team measured and recorded the pH, specific conductivity, and temperature of the groundwater from the wells being split sampled after purging was completed. A comparison of these field parameter measurements between the values measured by the and the ESP is provided in the following table.

**Table 3: Comparison of Field Parameter Measurements**

Well ID Number	pH			Temperature (°C)			Conductivity <sup>1</sup> (mS/cm)		
		ESP	%Diff <sup>2</sup>		ESP	%Diff <sup>2</sup>		ESP	%Diff <sup>2</sup>
LPZ-5	8.05	8.39	4.1	21.02	21.6	2.7	3.89	3.65	6.6
OBW-1	10.62	11.10	4.3	21.76	22.70	4.1	1.97	1.78	10.7
REC-4	6.35	6.76	6.1	21.46	20.9	2.7	2.60	2.35	10.6
MW-24B	6.53	7.00	6.7	23.54	23.0	2.4	2.38	2.00	19.0
MW-24A	6.29	6.89	8.7	20.07	21.1	4.9	1.59	1.45	9.7
	Avg. % Diff <sup>3</sup> :		6.0	Avg. % Diff <sup>3</sup> :		3.4	Avg. % Diff <sup>3</sup> :		11.3

Well ID Number	Dissolved Oxygen (%)			Dissolved Oxygen (mg/L)			Oxidation-Reduction Potential (mV)		
		ESP	%Diff <sup>2</sup>		ESP	%Diff <sup>2</sup>		ESP	%Diff <sup>2</sup>
LPZ-5	33.9	9.9	242.4	2.97	0.83	257.8	-207.6	-46	351.3
OBW-1	57.5	48.4	18.8	5.01	4.21	19.0	-19.7	-20.0	1.5
REC-4	30.5	14.0	117.9	2.67	1.19	124.4	-53.2	-47	13.2
MW-24B	10.3	12.7	18.9	0.86	1.16	25.9	-123.6	-144	14.2
MW-24A	8.9	12.7	29.9	0.80	1.09	26.6	-101.6	-139	26.9
	Avg. % Diff <sup>3</sup> :		85.6	Avg. % Diff <sup>3</sup> :		90.7	Avg. % Diff <sup>3</sup> :		81.4

°C = Degrees Celsius, % Diff = Percent Difference, Avg. % Diff = Average Percent Difference

Note 1: The Conductivity readings are reported in terms of millisiemens per centimeter.

Note 2: The Percent Differences was calculated by taking the absolute value of the difference between the Facility and ESP readings, dividing by the ESP reading, and then multiplying by 100.

Note 3: The Average Percent Differences were calculated by taking the absolute value of the Percent Difference values, summing them, and then dividing by the total number of readings taken.

The ESP audit reports noted several issues with the sampling practices, detailed below, that the should investigate and modify procedures prior to the next scheduled sampling event.

1. There were a few observations of the sampling personnel placing the sampling equipment on potentially contaminated surfaces. The sampling personnel placed most of the sampling equipment on a table, the water level indicator was either hung on the well casing or placed on the cement or grass next to the well head. The sampling personnel placed the one-eighth inch tubing on the ground while it was being placed in the well; this could have introduced contamination into the groundwater. Care must be taken when handling sampling equipment to prevent it from coming into contact with

potential contaminated surfaces. This would include making sure any surface that sampling equipment is placed on is thoroughly cleaned or clean plastic sheeting is used for each well.

2. While low-flow sampling was conducted at the , it was noticed that samples were not collected at rates below 100 mL/min. LPZ-5 was sampled at 80 mL/min, OBW-1 sampled at 120 mL/min, REC-4 was sampled at 225 mL/min, MW-24B was sampled at 170 mL/min, and MW-24A was sampled at 150 mL/min. This is acceptable, as long as water levels are stable during purging and sampling.
3. At LPZ-5 the pump was flowing backwards bubbling into the well for about one minute, which could have volatilized some sensitive parameters. Four of the five wells were sampled above 100 mL/minute. Also, the EPA "RCRA Groundwater Monitoring" November 1992 draft technical guidance 7.3.2.6 suggests that peristaltic pumps are not suitable for collecting volatile organic samples. Use of a peristaltic pump can cause sample mixing and oxidation resulting in degassing and loss of volatiles. This method can cause sample missing and oxidation resulting in degassing and loss of volatiles. The Facility may want to consider passive sampling methods such as passive diffusive bags (PDBs) or Snap Samplers<sup>®</sup> for future sampling events.
4. The ESP's samples were taken in proper procedural order with VOCs first, dissolved gasses second, TOC third, sulfide fourth, nitrate fifth, and then filling one Nalgene liter container for alkalinity, total dissolved solids, chloride, and sulfate. The Facility incorrectly identified which sample containers were to be used for which analyte. The Facility had incorrectly identified TOC samples being collected in a 1 L Nalgene bottle and metals collected in a 250 mL amber bottle. As a result the dissolved metal samples were collected third and the TOC samples were collected last. This does not follow the sampling order of VOA, total organic halides (TOX), TOC, semivolatiles (SVOCs), metals and cyanide, major water quality cations and anions, and radionuclides.
5. Calibration of the water quality meter took place the morning of the sampling event. However, during sampling, the ESP and the Facility's measurements varied significantly for oxidation-reduction potential in the first well. The ESP expected all comparative field measurements to vary to some extent since the was using a flow-through cell and the ESP was capturing purge water in a cup and taking separate measurements. The ESP asked the Facility to check the meter's calibration in a standard oxygen release potential (ORP) solution, the reading was 223 mV in a 200 standard solution. This is 10.4 percent variance from the standard solution. The ESP's reading was 198 mV which was 1 percent variation from the standard solution. personnel did not recalibrate their water quality instrument. Daily calibration is recommended, however, a recalibration should have been performed at the time the ORP measurements were noticed to be significantly different than the standard solution.

#### **4.5 Comparison of Groundwater Split Sampling Results**

On September 6, 2011, Ms. Hackler and Mr. Hannon of the Department's ESP collected selected split groundwater samples with the Facility's sampling team for this site. These split samples were collected to help investigate the sample collection and handling techniques being used by the Facility and to be able to make a comparison between the analytical results obtained by the laboratory contracted by the Facility and the ESP's laboratory. The split samples were collected from the following five monitoring wells: LPZ-5, OBW-1, REC-4, MW-24B, and MW-24A. In addition, the ESP and the Facility collected duplicate samples and included trip blanks in the shipping container(s) for QA/QC purposes.

The ESP split and duplicate samples were collected in certified-clean containers that were preserved in the field in accordance with Standard Operating Procedure #MDNR-FSS-001. The sample containers were stored on ice and transported back to Jefferson City, Missouri, to be analyzed by the state laboratory or for shipment to contract laboratories PDC of Peoria, Illinois, for sulfide analysis and TestAmerica in Austin Texas, for dissolved gasses.

All the ESP split, duplicate, and trip blank samples were analyzed for VOCs using EPA Test Method 8260B, Chloride by SM-4500-CL-E, and Sulfate by EPA 375.2. The ESP also had their samples analyzed or dissolved gasses through the contracted lab TestAmerica and sulfide analyzed by PDC. The ESP Audit Report in Appendix E contains copies of the ESP's laboratory results for these split, duplicate, and trip blank samples obtained during this September 6, 2011, sampling event.

All the Facility's split and duplicate samples were collected in containers that were supplied by their contracted laboratory. The VOA samples were collected in 40-ml vials. Dissolved gas samples were collected in 20 mL clear Teflon septum vials. Dissolved metals samples were collected in a one liter Nalgene bottle. Sulfide samples were collected in a 250 mL Nalgene bottles preserved with Zinc Acetate, and sodium hydroxide. TOC Organic Carbon was collected in one 250 mL amber glass bottle preserved with sulfuric acid.

After filling and labeling, the Facility's VOA, total metal, and dissolved metal samples were stored on ice in insulated coolers, until a driver from the contract laboratory picked them up. All the Facility's split, duplicate, trip blank, and rinse blank samples shipped to Pace Analytical were analyzed for VOCs using EPA Test Method 5030B/8260, dissolved gasses using RSK 175, dissolved metals using EPA Test Method 6010, carbon dioxide using EPA Test Method SM 4500-CO<sub>2</sub>D, and Nitrogen using EPA Test Method 353.2, and anions using EPA Test Method 300.0.

A comparison between the state's analytical laboratory results and the analytical results obtained from the Facility's laboratories is provided in the attached Table 4. Analytical results that were reported as being below the detection limit of the specific analytical method utilized were not included in the following comparison. The Facility's split sampling results are provided in Appendix F of this report.

As shown on Table 4, there is greater than an order of magnitude difference (in some cases two or three orders of magnitude) for several constituents including carbon dioxide in LPZ-5 and detected VOCs. Detections that exceed an order of magnitude difference are highlighted in **bold** on Table 4. A review of the results indicate a couple of potentially significant issues as detailed below.

1. The Facility's VOC results in some wells are below the EPA Maximum Contaminant Levels (MCLs) for groundwater while the ESPs VOC results are several orders of magnitude higher than the MCLs. For example, the MCL for cis-1,2-dichloroethene (DCE) is 70 ug/L. The Facility's laboratory result for cis-1,2-DCE was 12 ug/L and the ESPs result for cis-1,2-DEC was 32,700 ug/L. The difference between the Facility and the ESP's analytical results are over four orders of magnitude and a percent difference of 99.96 percent. Comparison of sampling results are similar in other wells and for other constituents. It is extremely important that the obtain representative sampling results. If sampling results are considerably lower than actual concentrations this could affect remediation time frames and result in the contamination remaining in place above cleanup levels. An additional split sampling event between the Facility and the ESP to verify sampling results is recommended.
2. An evaluation VOC detections that exceed an order of magnitude difference between the ESP and ESC labs did not identify any specific reason(s) or cause(s) to explain why there was such a significant difference for the specific constituents involved. A review of the Facility's purging and sampling procedures also did not identify any specific procedures being used that would account for these differences. It is noted that the ESP used the EPA Method 8260B and the Facility's lab used the EPA Method 5030B/8260 and that the ESP's samples were diluted.

The Facility should review the analytical results for the constituents with significant differences and the QA/QC data from their contract laboratory for the September 6, 2011, sampling event to determine if a specific reason and/or cause of the significant difference can be found.

3. The carbon dioxide detection in the Facility's analysis of LPZ-5 is greater than an order of magnitude higher than the ESP's analysis. An evaluation did not identify any specific reason(s) or cause(s) to explain why there was such a significant difference for the specific constituent involved. It is noted that the ESP used a contract lab (method not identified) and the Facility's lab used method SM 4500-CO2 D.

In addition to the split samples, the ESP collected duplicate samples from Well REC-4 to analyze for VOCs and Monitored Natural Attenuation (MNA) analytes. The Facility also collected duplicate samples including FBCSA MW-5 for VOCs and MNA analytes. Both the ESP and the included trip blanks in the shipping container(s) for VOC analysis and the also collected a rinse blank for subsequent VOC analysis.

A comparison of the analytical results from these duplicate samples collected by the Facility and the ESP is presented below in Table 5. All other analytical results were reported as being below the detection limits of the specific analytical method utilized and are not included in the table below.

**Table 5 Comparison of Results from True and Related Duplicate Samples <sup>1</sup>**

Chemical Name	FBCSA MW-5			REC-4		
	Facility			ESP		
	True Sample	Duplicate Sample	True-Duplicate Samples	True Sample	Duplicate Sample	True-Duplicate Samples
			Percent Difference <sup>2</sup>			Percent Difference <sup>2</sup>
	Results	Results		Results	Results	
Carbon Dioxide	824,000	871,000	5.70	197,000	176,000	-10.71
Chloride	7,900	8,900	12.66	353,000	354,000	0.28
Ethane	--	--	--	3.45	3.40	-1.45
Ethene	--	--	--	12.3	12.3	0
Methane	1,550	1,100	-29.03	313	310	-0.95
Sulfate	190,000	135,000	-28.95	238	234	-1.68
1,1-Dichloroethene	--	--	--	11.3	10.9	-3.54
1,2-Dichlorobenzene	--	--	--	5.19	5.01	-3.47
Acetone	--	10.9	--			
Benzene	--	--	--	5.89	<5.0	--
Chlorobenzene	183	182	0.55	963	939	-2.49
cis-1,2-Dichloroethene	--	--	--	3,370	3,440	2.07
Tetrachloroethene	--	--	--	3,510	3,460	-1.42
trans-1,2-Dichloroethene	--	--	--	75.7	79.9	5.55
Trichloroethene	--	--	--	14,500	13,400	-7.59
Vinyl Chloride	--	--	--	256	262	2.34

-- = The ESP sample was not tested for this metal.

Note 1: All concentrations reported in this table are expressed in terms of µg/L.

Note 2: The Percent Differences for the True-Duplicate samples were calculated by subtracting the true sample results from the duplicate sample results, dividing by the true sample results, and then multiplying by 100. A negative value indicates that the results for the duplicate sample are lower than the corresponding Facility or the ESP true sample results.

Note 3: The ESP results presented are estimated values as these detections were below the practical quantitative level.

Note 4: The ESP samples were analyzed by an outside contract laboratory for this chemical and the results presented are those reported by the contract laboratory.

The above comparison of the Facility's and the ESP's true-duplicate sampling results shows that most of the results are in relatively close agreement. The largest difference with the 's results was the -29.03 percent difference for the methane results. The largest difference with the ESP results was the -10.71 percent difference with the ESP's contract lab analysis for carbon dioxide. No VOCs were detected in the trip blanks for either the ESP or the Facility and no VOCs were detected in the Facility's rinse blank.

The discrepancies in the above true-duplicate results do not indicate any specific potential problems/issues with the sampling or handling procedures being used in the field by the Facility's sampling team.

## **5.0 CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Groundwater Sampling and Analysis Plan Review**

As required by 40 CFR 265.92(a), an adequate SAP must be maintained by the Facility. The SAP is written documentation detailing the overall operation of the groundwater monitoring system. The purpose of the SAP is to document the procedures used in sampling and analysis of groundwater monitoring wells such that these procedures are done in a proper and consistent manner regardless of the personnel involved. The SAP should be available to field personnel at all times. This includes contractors performing groundwater monitoring tasks for the Facility. Field personnel should be thoroughly familiar with the content of the site-specific SAP and are responsible for strict adherence to the SAP procedures.

The review of the Facility's current SAP determined that the document contains almost everything the HWP expects in a good quality SAP. However, the review did identify several issues, detailed below, that the Facility should consider submitting replacement pages to update the SAP to the current site conditions and sampling procedures.

1. The SAP should be updated to include specific container/cap type for each parameter, the volume of each type of sample analytical method, and the maximum parameter-specific holding time.
2. The laboratory QA/QC should include verification, validation, and reporting of analytical data (percent recoveries for spiked samples, analytical detection limits, raw analytical data and calculations, etc.).
3. The SAP should include a HASP. The SAP refers to a HASP as part of the IMWP. Ideally this information should be located with the SAP, because it is intended as a guide to those performing groundwater monitoring. Specific HASP items needed in the SAP as recorded in the SAP Worksheet include: special sample handling requirements, periodic medical monitoring for personnel, a field emergency contingency plan, the telephone numbers and location of emergency facilities, field personnel training requirements/documentation, and physical/chemical hazards discussion.
4. The SAP discussion of routine well inspections and maintenance procedures does not include other procedures for periodically assessing subsurface casing integrity (i.e., gauge ring, caliper logs, and down well video logging) and includes provisions for repair/replacement of wells if indicated.

### **5.2 Physical Integrity Inspection of Monitoring Wells**

As required by 40 CFR 265.91(c) and 40 CFR 265.92(a), monitoring wells must be constructed in a manner that maintains the structural integrity of the wellbore and completed in a manner that enables collection of representative groundwater samples. The MGS integrity inspection revealed that most of the wells are in good condition and structurally sound. However, the

following well maintenance and/or repair items should be addressed prior to the next groundwater sampling event. Documentation of the well repairs should be provided in the next annual report submittal.

1. There are no visible surface seals on eight monitoring wells (MW-2A, MW-2B, MW-2R, MW-19, OBW-1, VW-1, VW-2, and VW-2B). There are cracked and/or deteriorated surface seals at four monitoring wells (MW-3, MW-11B, MW-14, and OBW-2).
2. The protective casings are damaged or do not operate properly at MW-2A, MW-11B, and GM-2. There are four wells with damaged bolsters (MW-2A, MW-3, MW-4, and MW-11B). There are three monitoring wells that are not protected by bolsters (HW-1, MW-2B, and MW-31B). These bolsters may protect monitoring wells from being damaged.
3. The wood concrete forms are still attached to the surface seals of three wells (HW-1, MW-24A, and MW-24B) and may allow surface water to pool around the surface completion of the well.

### **5.3 Water Level and Total Well Depth Measurement Audit**

As required by 40 CFR 265.92, the Facility must obtain accurate well depth measurements, including the depth of the potentiometric surface and the total well depths. Total well depths should be used to evaluate/identify well siltation problems on at least a yearly basis.

A comparison of the water level measurements between the MGS and the Facility's sampling team is provided in Section 4.3. This comparison shows the measurements between the MGS and the Facility's consultant are generally in close agreement and supports the conclusion that the down-hole measurements being obtained and reported by the Facility are reasonably reliable and accurate.

Total depth measurements were not taken at this time, as they are to be taken at the time of sampling to avoid disturbing the water column in the well.

### **5.4 Field Sampling and Analysis Procedures Audit**

As required by 40 CFR 265.91(a)(2), 265.93(d)(4), and 265.93(d)(7), the Facility's sampling personnel must follow proper procedures for obtaining groundwater samples for subsequent analyses. Overall, the majority of the sample collection, handling procedures, and preservation techniques used by the Facility's sampling team appear to be capable of yielding reliable, consistent, and representative groundwater samples.

The main issues and/or deficiencies noted in the ESP audit and the MGS inspection reports are listed below and are discussed in more detail in Section 4.4 of this O&M Report. The Facility should investigate and modify these purging and/or sampling procedures prior to the next scheduled sampling event.

1. There were a few observations of the sampling personnel placing the sampling equipment on potentially contaminated surfaces. The sampling personnel placed most of the sampling equipment on a table with the water level indicator either hung on the well casing or placed on the cement or grass next to the well head. The sampling personnel placed the one-eighth inch tubing on the ground while it was being placed in the well; this could have introduced contamination into the groundwater. Care must be taken when handling sampling equipment to prevent it from coming into contact with potential contaminated surfaces. This would include making sure any surface that sampling equipment is placed on is thoroughly cleaned or clean plastic sheeting is used for each well.
2. While collecting low flow samples by the Facility, it was noticed that samples were not collected at rates below 100 ml/min. The LPZ-5 was sampled at 80 mL/min, OBW-1 was sampled at 120 mL/min, REC-4 was sampled at 225 mL/min, MW-24B was sampled at 170 mL/min, and MW-24A was sampled at 150 mL/min. This is acceptable, as long as water levels are stable during purging and sampling.
3. At LPZ-5 the pump was flowing backwards bubbling into the well for about one minute which could have volatilized some sensitive parameters. Four of the five wells were sampled above 100 mL/minute. Also, the EPA "RCRA Groundwater Monitoring" November 1992 draft technical guidance 7.3.2.6 suggests that peristaltic pumps are not suitable for collecting volatile organic samples. This method can cause pressure surges resulting in degassing and loss of volatiles. The Facility may want to consider passive sampling methods such as PDBs or Snap Samplers® for future sampling events.
4. The ESP's samples were taken in proper procedural order with VOCs first, dissolved gasses second, TOC third, sulfide fourth, nitrate fifth, and then filling one Nalgene liter container for alkalinity, total dissolved solids, chloride, and sulfate. The Facility incorrectly identified which sample containers were to be used for which analyte. The Facility had incorrectly identified TOX samples being collected in a 1 mL Nalgene bottle and metals collected in a 250 mL amber bottle. As a result the dissolved metal samples were collected third and the TOC samples were collected last. This does not follow the sampling order of VOA, TOX, TOC, SVOCs, metals and cyanide, major water quality cations and anions, and radionuclides.
5. Calibration of the water quality meter took place the morning of the sampling event. However, during sampling, the ESP and the Facility's measurements varied significantly for oxidation-reduction potential in the first well. The ESP expected all comparative field measurements to vary to some extent since the Facility was using a flow-through cell and the ESP was capturing purge water in a cup and taking separate measurements.

The ESP asked the Facility to check the meter's calibration in a standard ORP solution, the reading was 223 mV in a 200 standard solution. This is 10.4 percent variance from the standard solution. The ESP's reading was 198 mV which was 1 percent variation from the standard solution. The Facility personnel did not recalibrate their water quality instrument. Daily calibration is recommended; however, a recalibration should have been performed at the time the ORP measurements were noticed to be significantly different than the standard solution. The total difference in OR and ORP are likely attributed to a combination of the instrument calibration and contrast between the flow through cell and open containers used.

## **5.5 Comparison of Groundwater Split Sampling Results**

Part of an O&M Inspection Report involves comparing the analytical laboratory results from corresponding split samples obtained by the Department and the Facility during a sampling event. The review of the data indicated that some analytical results being obtained by the Facility differed more than an order of magnitude with those of the ESP. A review of these results indicates a couple of potentially significant issues with these results as detailed below.

1. The Facility's VOC results in some wells are below the EPA MCLs for groundwater while the ESPs VOC results are several orders of magnitude higher than the MCLs. For example, the MCL for cis-1,2-DCE is 70 ug/L. The Facility's laboratory result for cis-1,2-DCE was 12 ug/L and ESPs result for cis-1,2-dichloroethene was 32,700 ug/L. The difference between the Facility and the ESP's analytical results are over four orders of magnitude and a percent difference of 99.96 percent. Comparison of sampling results are similar in other wells and for other constituents. It is extremely important that the obtain representative sampling results. If sampling results are considerably lower than actual concentrations this could affect remediation time frames and result in the contamination remaining in place above cleanup levels. An additional split sampling event between the Facility and the ESP to verify sampling results is recommended.

An evaluation VOC detections that exceed an order of magnitude difference between the ESP and ESC labs did not identify any specific reason(s) or cause(s) to explain why there was such a significant difference for the specific constituents involved. A review of the Facility's purging and sampling procedures also did not identify any specific procedures being used that would account for these differences. It is noted that the ESP used EPA Method 8260B and the Facility's lab used EPA Method 5030B/8260 and that the ESP's samples were diluted. The Facility may want to review the analytical results for the constituents with significant differences and the QA/QC data from their contract laboratory for the September 6, 2011, sampling event to determine if a specific reason and/or cause of the significant difference can be found.

2. The carbon dioxide detection in the Facility's analysis of LPZ-5 is greater than an order of magnitude higher than the ESP's analysis. An evaluation did not identify any specific reason(s) or cause(s) to explain why there was such a significant difference for the specific constituent involved. It is noted that the ESP used a contract lab (method not identified) and the Facility's lab used method SM 4500-CO2 D.

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**Table 4 Comparison of Facility-ESP Split Sampling Results <sup>1</sup>**

Chemical Name	LPZ-5			OBW-1			REC-4			MW-24B			MW-24A		
	Facility Results	ESP Results	Percent Difference <sup>2</sup>	Facility Results	ESP Results	Percent Difference <sup>2</sup>	Facility Results	ESP Results	Percent Difference <sup>2</sup>	Facility Results	ESP Results	Percent Difference <sup>2</sup>	Facility Results	ESP Results	Percent Difference <sup>2</sup>
Carbon Dioxide	1,210,000	5740	20,980	51,800	<500	--	513,000	176,000 <sup>4</sup>	-70.57	908,000	215,000 <sup>4</sup>	322.33	728,000	226,000 <sup>4</sup>	222.12
Methane	11,100 <sup>8,9</sup>	8,860 <sup>4</sup>	25.28	703 <sup>8</sup>	1050 <sup>4</sup>	-33.05	289 <sup>8</sup>	313	6.38	9240 <sup>8,9</sup>	3640 <sup>4</sup>	17.74	4020 <sup>8,9</sup>	9860 <sup>4</sup>	-59.23
Ethane	66	71.4	-7.56	20.3	32.2	-36.96	<10.0	3.45	-7.67	12.1	5.93	153.85	<10.0	15.2	--
Ethene	209	264	-20.83	49	78.1	37.26	10.8	12.3	-12.20	<10.0	ND	--	<10.0	<0.25	--
Chloride	312,000	271,000	15.13	384,000	337,000	13.95	415,000	353,000	17.64	193,000	201,000	-3.98	98,800	117,000	-15.56
Nitrate	<100	71	--	<100	11 <sup>6</sup>	--	<100	<10.0	--	<100	57	--	<100	<10.0	--
Sulfate	18.400	29,600 <sup>5</sup>	-37.84	131,000	129,000	15.50	230,000	238,000	-3.61	1,000	8,480	-88.21	<100	6,440	--
Sulfide	NT	190,000 <sup>3</sup>	--	NT	<2000	--	NT	<2.000	--	NT	3.7 <sup>3</sup>	--	NT	<2000	--
1,1,1-Trichloroethane	<1.0	<50.0	--	<1.0	0.52 <sup>6</sup>	--	<1.0	<5.0	--	<1.0	<5.0	--	<1.0	<50.0	--
1,1-Dichloroethane	NT	787 <sup>4</sup>	--	NT	<5.0	--	NT	<5.0	--	NT	<5.0	--	NT	<50.0	--
1,1-Dichloroethene	NT	62.9 <sup>4,6</sup>	--	NT	13.7	--	NT	11.3 <sup>4</sup>	--	NT	<5.0	--	NT	<50.0	--
1,2-Dichlorobenzene	NT	142 <sup>4</sup>	--	NT	118	--	NT	5.19 <sup>4,6</sup>	--	NT	<5.0	--	NT	<50.0	--
1,2-Dichloroethane	<1.0	<50.0	--	<1.0	11	--	<1.0	<5.0	--	<1.0	<5.0	--	<1.0	<50.0	--
1,2,4-Trimethylbenzene	NT	<50.0	--	NT	0.52 <sup>6</sup>	--	NT	<5.0	--	NT	11.8 <sup>4</sup>	--	NT	275 <sup>4</sup>	--
1,3,5-Trimethylbenzene	NT	<50.0	--	NT	<5.0	--	NT	<5.0	--	NT	<5.0	--	NT	327 <sup>4</sup>	--
1,4-Dichlorobenzene	NT	<50.0	--	NT	9.86	--	NT	<5.0	--	NT	<5.0	--	NT	<50.0	--
2-Chlorotoluene	NT	<50.0	--	NT	1.2	--	NT	<5.0	--	NT	<5.0	--	NT	<50.0	--
4-Chlorotoluene	NT	<50.0	--	NT	0.92 <sup>6</sup>	--	NT	<5.0	--	NT	<5.0	--	NT	<50.0	--
Acetone	<10.0	<1000	--	<10.0	36.8	--	<10.0	<100	--	<10.0	<100	--	<10.0	<1000	--
Benzene	<1.0	<50.0	--	<1.0	34	--	<1.0	5.89 <sup>4,6</sup>	--	161	76,100 <sup>4</sup>	-99.79	91.8	22,900 <sup>4</sup>	-99.60
Bromobenzene	NT	<50.0	--	NT	0.82 <sup>6</sup>	--	NT	<5.0	--	NT	<25.0	--	NT	<50.0	--
Chlorobenzene	<1.0	<50.0	--	4.5	15,300 <sup>4</sup>	-99.97	<1.0	963 <sup>4</sup>	--	30	66,900 <sup>4</sup>	-99.96	83.7	6,230 <sup>4</sup>	-98.66
Chloroform	1.0 <sup>11</sup>	<50.0	--	<1.0	30.9	--	1.0 <sup>11</sup>	<5.0	--	1.0 <sup>11</sup>	<5.0	--	1.1 <sup>11</sup>	<50.0	--
cis-1,2-Dichloroethene	12	32,700 <sup>4</sup>	-99.96	5.8	18,800 <sup>4</sup>	-99.97	2.0	3370 <sup>4</sup>	-99.94	<1.0	<5.0	--	<1.0	<50.0	--
Ethylbenzene	<1.0	<50.0	--	<1.0	0.84 <sup>6</sup>	--	<1.0	<5.0	--	5.0	160 <sup>4</sup>	-96.88	<1.0	340 <sup>4</sup>	--
m&p-Xylenes	NT	<50.0	--	NT	1.07 <sup>6</sup>	--	NT	<5.0	--	NT	80.2 <sup>4</sup>	--	NT	333 <sup>4</sup>	--
Napthalene	NT	<250	--	NT	<25.0	--	NT	<25.0	--	NT	<25.0	--	NT	390 <sup>4,6</sup>	--
Nitrobenzene	NT	<500	--	NT	7440 <sup>4</sup>	--	NT	<50.0	--	NT	<50.0	--	NT	<500	--
o-Xylene	NT	<50.0	--	NT	0.87 <sup>6</sup>	--	NT	<5.0	--	NT	45.4 <sup>4</sup>	--	NT	136 <sup>4</sup>	--
p-Isopropyltoluene	NT	<50.0	--	NT	4.15	--	NT	<5.0	--	NT	<5.0	--	NT	<50.0	--
Tetrachloroethene	<1.0	<50.0	--	60.5	192,000 <sup>4</sup>	-99.97	2.6	3510 <sup>4</sup>	-99.93	<1.0	<5.0	--	<1.0	<50.0	--
Toluene	157	197,000 <sup>4</sup>	-99.92	2.1	199	-98.94	<1.0	<5.0	--	1.7	298 <sup>4</sup>	-99.43	<1.0	216 <sup>4</sup>	--
Total Xylene	<3.0	<50.0	--	<3.0	1.74 <sup>6</sup>	--	<3.0	<10.0	--	6.8	126 <sup>4</sup>	-94.60	<3.0	<100	--
Trans-1,2-Dichloroethene	<1.0	149 <sup>4</sup>	--	<1.0	185	--	<1.0	75.7 <sup>4</sup>	--	<1.0	<5.0	--	<1.0	<50.0	--
Trichloroethene	<1.0	2020 <sup>4</sup>	--	3.6	13,300 <sup>4</sup>	-99.97	4.0	14,500 <sup>4</sup>	-99.97	<1.0	<5.0	--	<1.0	<50.0	--
Methylene Chloride	2.0 <sup>10</sup>	<1000	--	2.4 <sup>10</sup>	<100	--	3.4 <sup>10</sup>	<100	--	3.1 <sup>10</sup>	<100	--	3.1 <sup>10</sup>	<1000	--
Vinyl Chloride	<1.0	7730 <sup>4,7</sup>	--	<1.0	2130 <sup>4</sup>	--	<1.0	256 <sup>4,7</sup>	--	<1.0	<5.0	--	<1.0	<50.0	--

NT = The ESP did not test the samples for this metal, NR = Not Reported.

Note 1: All concentrations reported in this table are expressed in terms of micrograms per liter (µg/L).

Note 2: The Percent Differences for Facility-ESP Split Samples were calculated by subtracting the ESP's split sample results from the corresponding Facility's results, dividing by the ESP's sample results, and then multiplying by 100. A positive value indicates that the Facility's split sample results are higher than the corresponding ESP split sample results.

Note 3: Exceeded holding time

Note 4: Sample was diluted

Note 5: Estimated value, matrix interference

Note 6: Estimated value, below PQL

Note 7: Estimated value, outside QC limits

Note 8: Analyzed within holding time, but had QC failures. Reanalyzed outside holding time, confirmed original result.

Note 9: Estimated value, outside calibration range

Note 10: Above QC limits, may be biased high

Note 11: Analyte also detected in method blank

## APPENDIX A - FACILITY COMPLIANCE HISTORY

The following is a chronology of the regulatory compliance history relevant to groundwater monitoring, corrective action, and site/waste characterization at the Solutia Queeny Plant since the Operation and Maintenance (O&M) conducted in December 2005. A complete list of correspondence among Solutia, the U.S. Environmental Protection Agency (EPA), and the Missouri Department of Natural Resources (Department) can be found in the Agencies' *Resource Conservation and Recovery Act* (RCRA) files for Solutia.

- 09/30/02**      The Department transmits the *Environmental Indicator Evaluations for Current Human Exposures Under Control* (CA725) and *Migration of Contaminated Groundwater Under Control* (CA750) to Solutia. CA725 Human Exposures Under Control was coded as a "YES" and CA750 Migration of Contaminated Groundwater was coded as "IN" (insufficient information to make a determination).
  
- 12/17/03**      Solutia submits notice of Chapter 11 Bankruptcy to EPA and the Department.
  
- 11/12/04**      The EPA and the Department complete the *Migration of Contaminated Groundwater Under Control* (CA750) environmental indicator to Solutia. The CA750 was coded as "yes" migration of contaminated groundwater is under control.
  
- 03/01/05**      Solutia submits an updated Risk Assessment and Development of site-specific Media Cleanup Goals in selected areas.
  
- 05/02/05**      Solutia notifies EPA and the Department that they are selling a portion of the property which included the former Rhodia property and the surrounding WW Building Area and KK Building Area. These areas were investigated and determined that no further action is necessary.
  
- 06/13/05**      Solutia notifies EPA and the Department that they have placed a special warranty deed on the property sold to Ted Ahrens. The special warranty deed restricts the property to commercial or industrial use, prohibits the use of groundwater, and provides easements to Solutia for purposes of corrective action.
  
- 12/06/05**      The Department submits an O&M to Solutia. The comprehensive monitoring evaluation evaluated the technical and regulatory adequacy of the groundwater monitoring system implemented at the Solutia Queeny Plant.
  
- 02/08/06**      Solutia submits response to the O&M prepared by the Department.
  
- 02/27/06**      The Department approves Solutia's response to the O&M Report.

06/13/06 The EPA submits letter agreeing with the conclusions in the Conceptual Risk Management Plan and request that Solutia proceed with drafting the RCRA Corrective Measures Study (CMS) Report.

06/30/06 Solutia submits the updated 2005 Risk Assessment and Conceptual Risk Management Plan for selected areas at the Solutia Queeny Plant. This plan was updated to incorporate additional data collected at the FF Building Area, the VV Building Area, the former Acetanilides Area, and the former Bulk Chemical Storage Area.

12/04/06 The EPA and the Department submit comments on the updated 2005 Risk Assessment and Conceptual Risk Management Plan.

01/26/07 Solutia submits the updated 2005 Risk Assessment and Conceptual Risk Management Plan for selected areas at the Solutia Queeny Plant. This plan was updated to incorporate updated EPA toxicity factors.

02/28/07 The EPA and the Department submit letter approving the updated 2005 Risk Assessment and Conceptual Risk Management Plan and requires Solutia to prepare and submit a CMS Report.

04/06/07 The EPA submits letter notifying the Facility that they are in the RCRA Corrective Action 2020 universe.

05/04/07 Solutia submits RCRA CMS for the Solutia Queeny Plant. The CMS evaluates and proposes a final remedy for the FF Building Area, the VV Building Area, the former Acetanilides Area, and the former Bulk Chemical Storage Area.

04/09/08 Solutia submits letter notifying the EPA and the Department of the sale of the Solutia Queeny Plant to SWH Investments II and Environmental Operations, Incorporated. The letter states that the buyer will assume all corrective action responsibilities.

05/22/08 Meeting between the EPA and Solutia to discuss mechanism enforcing for performance of the final remedy by the purchaser of the Solutia property.

06/09/08 The EPA and the Department provide comments on the CMS Report. CMS comments need to address any future interim measures and/or final remedy undertaken by the prospective purchaser.

12/25/08 Environmental Operations, Incorporated, submits an Interim Measures Work Plan (IMWP). The IMWP proposes injection of RegenOx™ and ORCAAdvanced™ to reduce light non-aqueous phase liquid and residual mass sources to groundwater by 75 percent in the FF Building Area, the former Acetanilides Area, and the

former Bulk Chemical Storage Area. The Work Plan also proposed the excavation and removal of polychlorinated biphenyl (PCB) contaminated soil in the VV Building Area.

- |                       |   |
|-----------------------|---|
| <b>01/28/09</b>       | The Department electronically submitted comments on the draft IMWP to Environmental Operations, Incorporated, and the EPA.  |
| <b>02/06/09</b>       | Environmental Operations, Incorporated, submits a revised IMWP.   |
| <b>02/20/09</b>       | The Department submits letter approving the underground injection activity portion of the IMWP.   |
| <b>03/11/09</b>       | The EPA submits letter approving the IMWP.  |
| <b>05/11-06/09/09</b> | Public comment period held by the EPA for PCB removal portion of the IMWP. No comments were received.   |
| <b>09/30/09</b>       | The EPA issues Administrative Order on Consent (AOC) to SWH Investments II and Environmental Operations, Incorporated. The AOC is the regulatory mechanism requiring performance of interim measures and implementation of a final remedy at the site.        |
| <b>03/17/10</b>       | Environmental Operations, Incorporated, submits the Work Plan for Baseline Groundwater Monitoring at the Facility.  |
| <b>07/19/10</b>       | The EPA and the Department submit comments on the Work Plan of Baseline Groundwater Monitoring.   |
| <b>08/17/10</b>       | Environmental Operations, Incorporated, submits letter addressing the EPA and the Department's comments on the Work Plan for Baseline Groundwater Monitoring.   |
| <b>10/06/10</b>       | Environmental Operations, Incorporated, submits revised Work Plan for Baseline Groundwater Monitoring incorporating the EPA and the Department's comments.  |
| <b>08/29/11</b>       | The Department's Missouri Geological Survey submits the O&M inspection report of the monitoring well network at the site.   |
| <b>09/06/11</b>       | The Department's Environmental Services Program (ESP) submitted a RCRA O&M Sampling Audit Report.   |
| <b>11/29/11</b>       | The Department approves modification to the injection activities previously approved as part of the IMWP. The modifications include adding 3B micro Emulsion® and BioDechlor Inoculum® Plus to augment the RegenOx™ and ORCAdvanced™ in the FF Building Area. |

## **Appendix B**

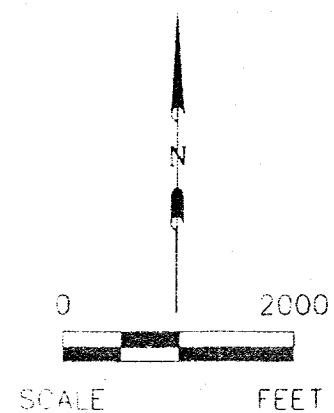
### **Location Maps of Region, Site and Regulated Units, Monitoring Well Locations and Hydrogeologic Information for Site**



**LEGEND**

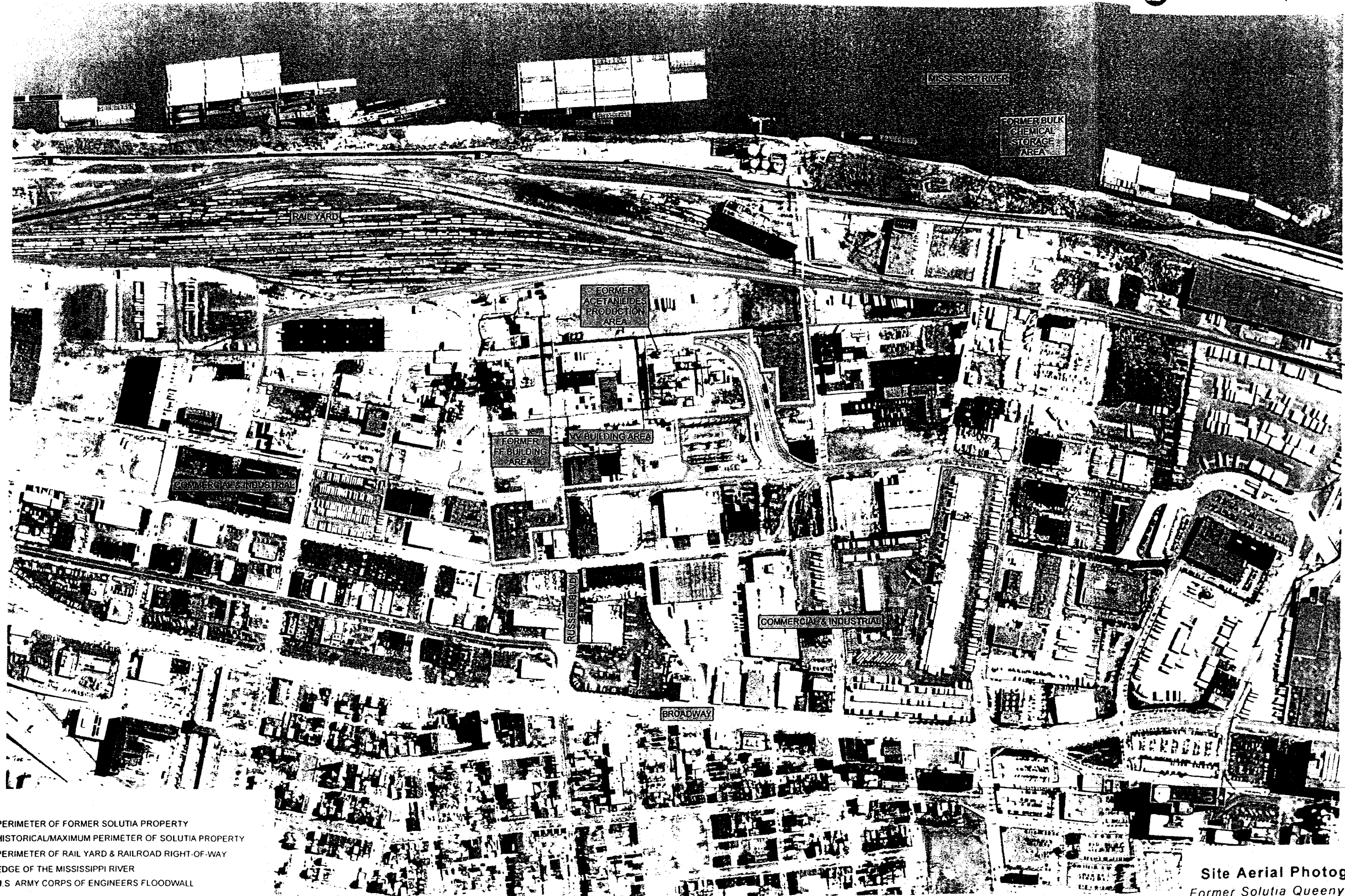
— GENERAL LOCATION OF  
J.F. QUEENY PLANT

BASE MAP REFERENCE: MAP TAKEN FROM ELECTRONIC  
USGS DIGITAL RASTER GRAPHIC 7.5 MINUTE SERIES  
TOPOGRAPHIC MAP OF CAHOKIA, ILLINOIS, REVISED 1952.

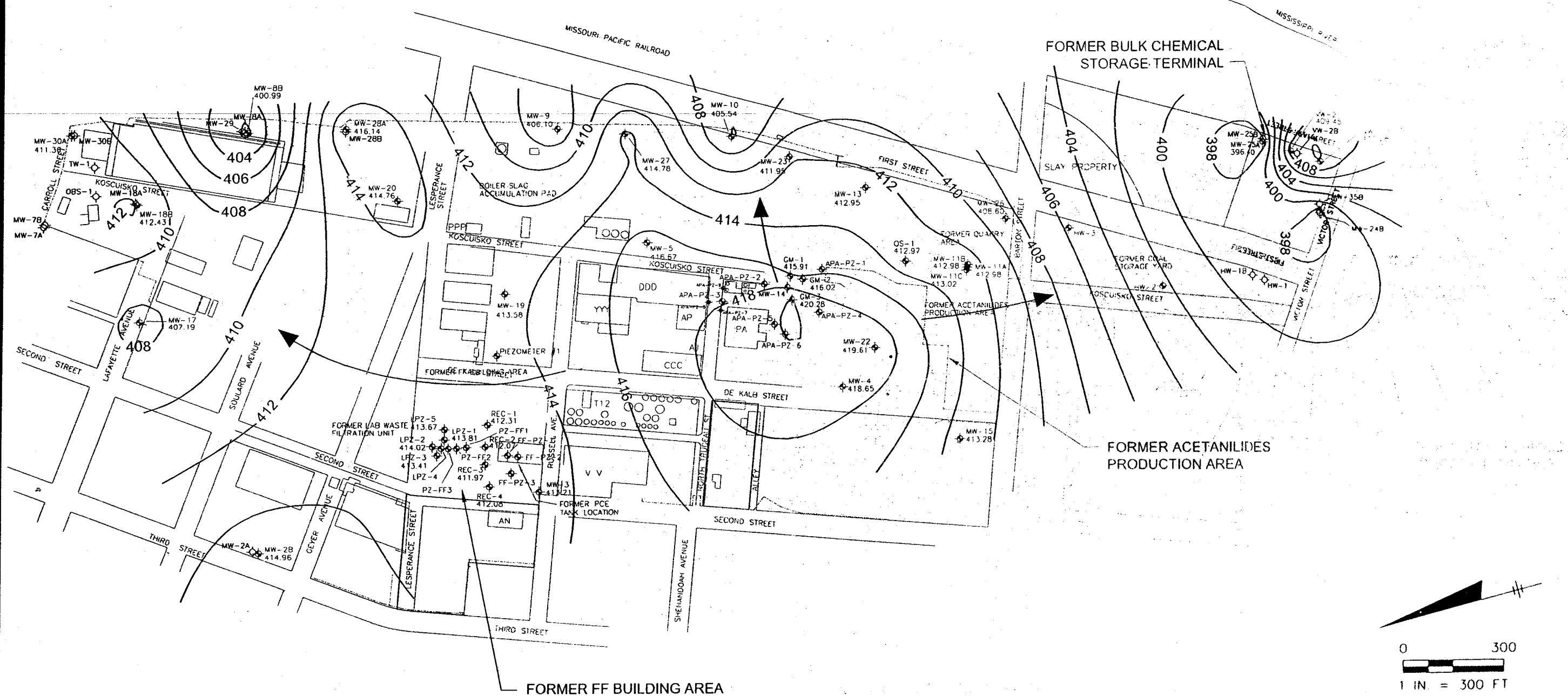


**Site Location Map**  
Former Solutia Queeny Plant  
Saint Louis Missouri

Figure 1-1



Site Aerial Photograph  
Former Solutia Queeny Plant  
Saint Louis Missouri

**LEGEND**

GROUNDWATER MONITORING WELLS AND PIEZOMETERS

MW-15

WELLS SCREENED IN THE FILL AND SILTY CLAY UNIT

WELLS SCREENED IN THE SAND OR BEDROCK UNITS (GRAYSCALE FONT)

—388—

GROUNDWATER CONTOUR (FEET, MSL) (BASED ON MEASUREMENTS RECORDED ON FEBRUARY 2-4, 2005)



ESTIMATED GROUNDWATER FLOW DIRECTION

**NOTES:**

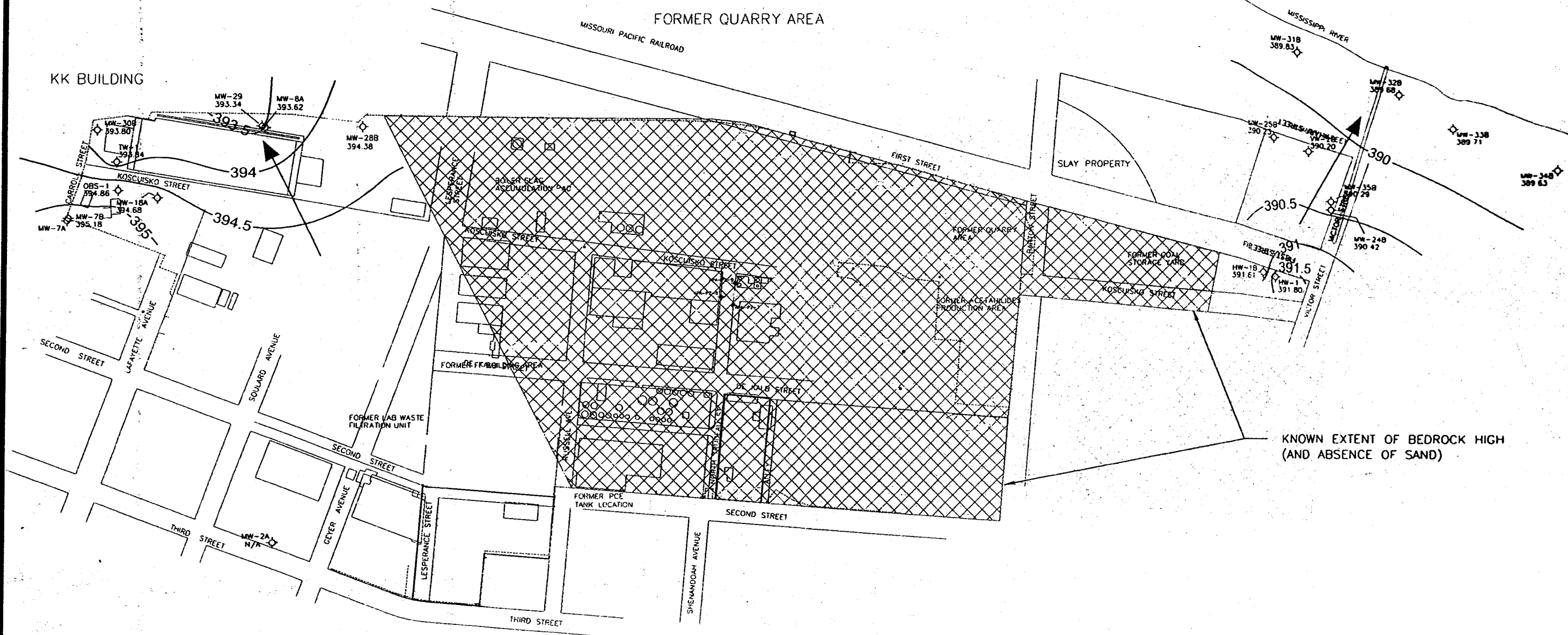
- 1) THE CONTOUR LINES DEPICT GENERALIZED FLOW CONDITIONS OF THE FILL AND SILTY CLAY UNIT. THE DEPRESSIONS AND MOUNDING (e.g. IN THE VICINITY OF KK BUILDING AREA AND THE FBCSA) ARE CAUSED BY THE HETEROGENEOUS NATURE OF THE FILL AND SILTY CLAY UNIT.
- 2) WELLS REC-1 THROUGH REC-4 ARE SCREENED ACROSS THE FILL AND SILTY CLAY AND SAND UNITS. BASED ON WATER LEVEL MEASUREMENT DATA, THESE WELLS ARE INCLUDED ON THE FILL AND SILTY CLAY UNIT MAP.

**REFERENCE:**

RCRA FACILITY INVESTIGATION  
DATA GAP WORK PLAN JOHN  
F. QUEENY PLANT BY O'BRIEN  
& GERE ENGINEERS, INC.,  
SEPTEMBER 1999

**Groundwater Potentiometric Surface Map**  
**Fill and Silty Clay Unit**  
Former Solutia Queeny Plant  
Saint Louis, Missouri

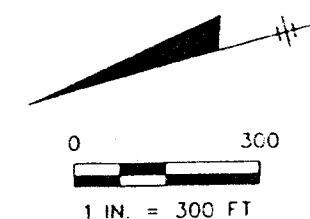
Figure 2-7



LEGEND

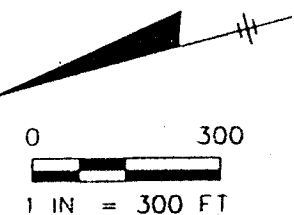
- GROUNDWATER MONITORING WELLS AND PIEZOMETERS
- MW-2A WELLS SCREENED IN THE SAND UNIT
- WELLS SCREENED IN THE FILL AND SILTY CLAY OR BEDROCK UNITS (GRAYSCALE FONT)
- SAND IS ABSENT
- 398 GROUNDWATER CONTOUR (FEET, MSL) (BASED ON MEASUREMENTS RECORDED ON FEBRUARY 2-5, 2005)
- ESTIMATED GROUNDWATER FLOW DIRECTION

REFERENCE:  
RCRA FACILITY INVESTIGATION  
DATA GAP WORK PLAN JOHN  
F. QUEENY PLANT BY O'BRIEN  
& GERE ENGINEERS, INC.,  
SEPTEMBER 1999



Groundwater Potentiometric Surface Map  
Sand Unit  
Former Solutia Queeny Plant  
Saint Louis, Missouri

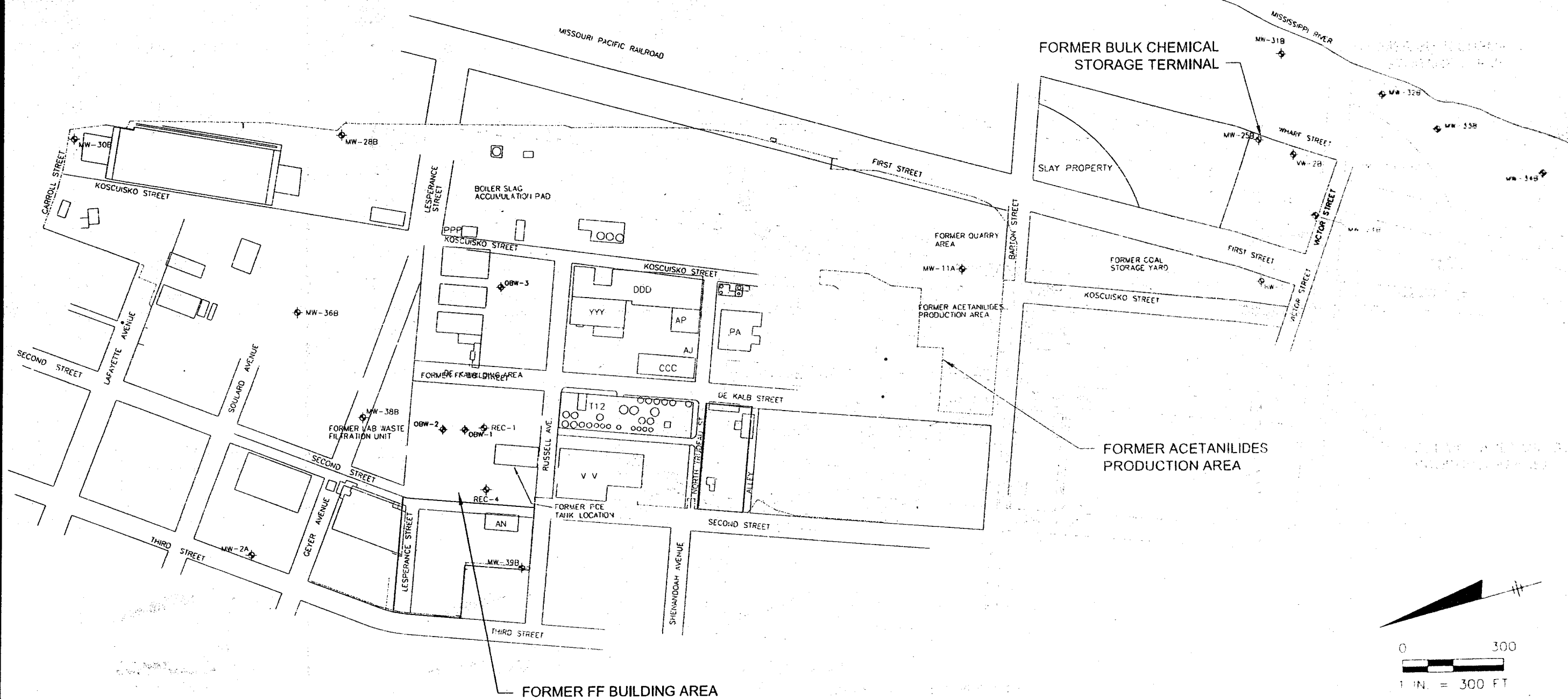
Figure 2-8



1) Wells MW-32A, MW-33A, MW-36A, MW-38A, MW-39A to be installed.

**Groundwater Monitoring Network**  
**Fill and Silty Clay Unit**  
*Former Solutia Queeny Plant*  
*Saint Louis, Missouri*

**Figure 4-1**



LEGEND

- ◆ GROUNDWATER MONITORING WELLS (SAND)
- ◆ GROUNDWATER MONITORING WELLS (BEDROCK)

NOTES:  
1.) Wells MW-33B, MW-36B, MW-38B, MW-39B to be installed.

REFERENCE:  
RCRA FACILITY INVESTIGATION  
DATA GAP WORK PLAN JOHN  
F. QUEENY PLANT BY O'BRIEN  
& GERE ENGINEERS, INC.,  
SEPTEMBER 1999

**Groundwater Monitoring Network Map**  
**Sand and Bedrock Units**  
Former Solutia Queeny Plant  
Saint Louis, Missouri

Figure 4-2

## **Appendix C**

### **Construction Diagram or Boring Logs for New Monitoring Wells**

## **Appendix D**

### **Groundwater Sampling and Analysis Plan Worksheet**

## SAMPLING AND ANALYSIS PLAN REVIEW CHECKLIST - GROUNDWATER

Prepared by  
MISSOURI DEPARTMENT OF NATURAL RESOURCES  
HAZARDOUS WASTE PROGRAM

Facility Name and Address: Former Solutia J.F. Queeny Plant – Environmental Operations Inc.  
200 Russell St.  
St. Louis, MO  
EPA ID No. MOD 004 954 111

Date(s) of SAP evaluation: May 30, 2012  
Person performing evaluation: Christine Kump-Mitchell  
Date and Source of SAP evaluated: Baseline Groundwater Monitoring Plan  
October 6, 2010

Y/N/NA

1. Does the Sampling and Analysis Plan (SAP) specify that the following field data be measured and recorded (field logbook or sample sheets) during each sampling event:

a.	Water level (each sampling event)?	<u>Y</u>
b.	Total well depth (at least annually)?	<u>Y</u>
c.	Weather (temp, general atmospheric conditions)?	<u>Y</u>
d.	Physical condition of the well?	<u>Y</u>
e.	Sampling team members?	<u>Y</u>
f.	Well number, date and time of sampling?	<u>Y</u>
g.	Physical description of well area?	<u>Y</u>
h.	Instrument calibration information (before and after)?	<u>Y</u>
i.	Actual well purge volume and calculations?	<u>Y</u>
j.	Presence/thickness of any immiscible layers present?	<u>Y</u>
k.	Any deviation from planned sampling methodology?	<u>Y</u>

2. For well purging does the SAP specify:

a.	Purging technique?	<u>Y</u>
b.	Type/composition of equipment (manufacture, model)?	<u>Y</u>
c.	Dedicated equipment?	<u>Y</u>
d.	Non-dedicated equipment?	<u>Y</u>
e.	Decontamination procedures for non-dedicated equipment?	<u>Y</u>
f.	Volume to purge (generic)?	<u>Y</u>
g.	Method of calculation of purge volume?	<u>Y</u>
h.	Use of stabilized field parameters (pH, Temperature, Specific Conductivity, Eh) to determine when purging is complete?	<u>Y</u>

**HWP SAP Review Checklist - Groundwater**Y/N/NA**2. For well purging does the SAP specify (cont):**

- |    |   |          |
|----|---|----------|
| i. | Method to prevent purge equipment contact with contaminated surfaces. | <u>Y</u> |
| j. | Manner of disposal of purged fluids?                                  | <u>Y</u> |

**3. For well sampling does the SAP specify:**

- |    |  |          |
|----|--|----------|
| a. | Sampling technique (gentle bailer lowering, bottom discharge for volatiles, pump rates, etc.)? | <u>Y</u> |
| b. | Type/composition of equipment (manufacture, model)?  | <u>Y</u> |
| c. | Dedicated equipment?   | <u>Y</u> |
| d. | Non-dedicated equipment?   | <u>Y</u> |
| e. | Decontamination procedures for non-dedicated equipment?  | <u>Y</u> |
| f. | Dry well contingency plan for persistently dry wells?  | <u>Y</u> |
| g. | Sampling protocol for low yield wells?   | <u>Y</u> |
| h. | Sampling protocol of high yield wells?   | <u>Y</u> |
| i. | Immiscible phase detection methods?  | <u>Y</u> |
| j. | Immiscible phase sampling methods?   | <u>Y</u> |
| k. | Pump and/or bailer intake level (generally)?   | <u>Y</u> |
| l. | Pump rate (non-volatilization of sensitive parameters)?  | <u>Y</u> |
| m. | Sampling order according to parameter volatilization potential?                                | <u>Y</u> |

**4. In relation to the monitored parameters does the SAP specify:**

- |    |  |          |
|----|--|----------|
| a) | Parameters required by regulation (detection)? | <u>Y</u> |
| b) | Waste-specific parameters (assessment)?        | <u>Y</u> |

**5. In sampling for site-specific parameters does the SAP specify:**

- |    |  |          |
|----|--|----------|
| a. | Specific container/cap type for each parameter?                    | <u>N</u> |
| b. | Volume of each type of sample container?                           | <u>N</u> |
| c. | Parameter specific preservative method (chemical and/or cooling)?  | <u>Y</u> |
| d. | Maximum parameter-specific holding time?                           | <u>N</u> |
| e. | Sample container labeling requirements?                            | <u>Y</u> |
| f. | Method of packaging & shipment (coolers, blue ice, carrier, etc.)? | <u>Y</u> |

**6. In relation to field and laboratory Quality Assurance/Quality Control (QA/QC) does the SAP specify:**

- |    |  |          |
|----|--|----------|
| a. | General QA/QC procedures?  | <u>Y</u> |
| b. | Use and frequency of trip blanks (e.g., 1 trip blank per container type)?  | <u>Y</u> |
| c. | Trip blank preparation protocol?   | <u>Y</u> |
| d. | Use and frequency of equipment blanks where non-dedicated samplers are used (e.g., one per non-dedicated sampling equipment type)? | <u>Y</u> |
| e. | Equipment blank preparation protocol?  | <u>Y</u> |
| f. | Use and frequency of duplicate samples (e.g., 5-10% of total samples)?   | <u>Y</u> |

**HWP SAP Review Checklist - Groundwater**Y/N/NA**6. In relation to field and laboratory QA/QC (con't):**

- |    |   |          |
|----|---|----------|
| g. | Split/duplicate sampling protocol?  | <u>Y</u> |
| h. | Use and frequency of spiked samples as an indicator of analytical performance or cross-contamination?   | <u>Y</u> |
| i. | Spike sample preparation protocol?  | <u>Y</u> |
| j. | Replicate parameter sampling protocol [e.g., pH, Specific Conductivity, Total Organic Halides (TOX), Total Organic Carbon (TOC)]?                             | <u>Y</u> |
| k. | Calibration frequency for field and laboratory analytical equipment?  | <u>Y</u> |
| j. | Verification & reporting of analytical data (percent recoveries for spiked samples, analytical detection limits, raw analytical data and calculations, etc.)? | <u>N</u> |

**7. In relation to contaminated equipment does the SAP discuss:**

- |    |  |          |
|----|--|----------|
| a. | Decontamination of field equipment other than that used for purging or sampling (e.g., analytical instrument probes, depth measuring devices, etc.)?                           | <u>Y</u> |
| b. | Decontamination of laboratory equipment (e.g., sample bottles, sample analysis equipment, contaminated sample shipment containers)?  | <u>Y</u> |
| c. | Disposal of potentially contaminated sampling equipment and clothing (e.g., glassware, plasticware, sample coolers containing broken sample bottles, gloves, coveralls, etc.)? | <u>Y</u> |

**8. Does the SAP discuss sample Chain-of-Custody (COC) including:**

- |    |                                      |          |
|----|--------------------------------------|----------|
| a. | Field and laboratory COC procedures? | <u>Y</u> |
| b. | Disposition of samples?              | <u>Y</u> |
| c. | COC sample forms?                    | <u>Y</u> |

**9. Does the SAP include a Health and Safety Plan (HASP) that discusses:**

- |    |   |           |
|----|---|-----------|
| a. | Required level of personal protection?  | <u>Y</u>  |
| b. | Required or recommended personal protective/monitoring equipment?   | <u>Y</u>  |
| c. | Use of a photo-ionization detector or HNU meter to check the wellbore headspace prior to sampling in wells known or suspected of being contaminated with volatile organics? | <u>Y</u>  |
| d. | Special sample handling requirements?   | <u>N*</u> |
| e. | Periodic medical monitoring for site personnel?   | <u>N*</u> |
| f. | A field emergency contingency plan?   | <u>N*</u> |
| g. | The telephone numbers and location of emergency facilities?   | <u>N*</u> |
| h. | Field personnel training requirements/documentation?  | <u>N*</u> |
| i. | Physical/chemical hazards discussion?   | <u>N*</u> |

## HWP SAP Review Checklist - Groundwater

Y/N/NA

**10. Does the SAP specify routine well inspection and maintenance procedures including:**

- |    |  |          |
|----|--|----------|
| a. | Inspection and documentation of all visible components of each monitoring well (See O&M Worksheet 3 of 3) during each groundwater elevation measurement/sampling event?                              | <u>Y</u> |
| b. | A copy of the well inspection worksheet used to document the above inspections?  | <u>Y</u> |
| c. | Contingencies for well repair/replacement within a reasonable time frame should the well integrity inspection reveal damage?   | <u>Y</u> |
| d. | A contingency for inspection of wells contacted by flood waters as soon as such waters recede enough to perform such inspection?   | <u>Y</u> |
| e. | Measurement of total depth to $\pm 0.1$ foot in each well at least annually?   | <u>Y</u> |
| f. | Comparison of total versus as-built depths for each well at least annually to assess the degree of well screen occlusion?  | <u>Y</u> |
| g. | A well redevelopment trigger criterion (e.g., 5-10% of screen) as based on the degree of well screen occlusion/contaminants of concern including a general time frame for such redevelopment?        | <u>Y</u> |
| h. | Other procedures for periodically assessing subsurface casing integrity (e.g., gauge ring, caliper logs, down well video logging) including provisions for repair/replacement of wells if indicated? | <u>N</u> |

**11. Additional comments pertaining to the Sampling & Analysis Plan:**

\*This information was submitted under a separate Health and Safety Plan as part of the facility Quality Assurance Project Plan and Interim Measures Work Plan.

## **Appendix E**

### **Operation and Maintenance Inspection Report (Prepared by the Missouri Department of Natural Resources Division of Geology and Land Survey)**

# Queeny-Solutia, St. Louis



## Division of Geology and Land Survey Operation and Maintenance Well Inspection

Sheet 1

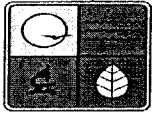


Inspection Date: 8-29-11

MW ID		Surface Well Seal						
		Composition	Condition	Dimension	Coverage	Sloped	Ponded	Run-off
1	MW-2A	*	*	*	*	*	No	No
2	MW-2B	*	*	*	*	*	No	No
3	MW-2R	*	*	*	*	*	No	No
4	MW-3	Concrete	Broken	3'x4'	85%	*	No	No
5	MW-4	Concrete	Intact	2' Diam.	100%	Yes	No	No
6	MW-11A	Concrete	Intact	2' Diam.	100%	Yes	No	No
7	MW-11B	Concrete	Poor	2' Diam.	*	*	*	*
8	MW-14	Concrete	Cracked	2' Diam.	100%	Yes	No	No
9	MW-15	*	*	*	*	*	*	*
10	MW-19	*	*	*	*	*	No	No
11	MW-24A	Concrete	Intact	2'x2'	100%	Yes	No	No
12	MW-24B	Concrete	Intact	2'x2'	100%	Yes	No	No
13	MW-25A	Concrete	Intact	2'x2'	100%	Yes	No	No
14	MW-25B	Concrete	Intact	2'x2'	100%	Yes	No	No
15	MW-31B	Concrete	Intact	2' Diam.	100%	Yes	No	No
16	MW-32A	Concrete	Intact	2' Diam.	100%	Yes	No	No
17	MW-32B	Concrete	Intact	2'x2'	100%	Yes	No	No
18	MW-33A	Concrete	Intact	2' Diam.	100%	Yes	No	No
19	MW-33B	Concrete	Intact	2' Diam.	100%	Yes	No	No
20	MW-34B	*	*	*	*	*	*	*
21	MW-35B	Concrete	Intact	2'x2'	100%	Yes	No	No
22	MW-39A	Concrete	Intact	2' Diam.	100%	Yes	No	No
23	MW-39B	Concrete	Intact	2' Diam.	100%	Yes	No	No
24	FBCSA MW-5	Concrete	Intact	2'x2'	100%	Yes	No	No
25	GM-1	Concrete	Intact	2' Diam.	100%	Yes	No	Yes
26	GM-2	Concrete	Intact	2' Diam.	100%	Yes	No	Yes
27	HW-1	Concrete	Intact	2'x2'	100%	Yes	No	No
28	LPZ-4s/4d	Concrete	Intact	2'x2'	100%	Yes	No	No
29	LPZ-5	Concrete	Intact	2' Diam.	100%	Yes	No	No
30	OBW-1	*	*	*	*	*	No	No
31	OBW-2	Concrete	Broken	2' Diam.	50%	Yes	No	No
32	OBW-3	Concrete	Intact	3'x3'	100%	Yes	No	No
33	VW-1	*	*	*	*	*	No	No
34	VW-2	*	*	*	*	*	No	No
35	VW-2B	*	*	*	*	*	No	No

\* See Notes

# Queeny-Solutia, St. Louis



## Division of Geology and Land Survey Operation and Maintenance Well Inspection



Sheet 2

Inspection Date: 8-29-11

MW ID		Protective Casing			Protective Casing Cap			Weep Hole		
		Type	Composition	Condition	Type	Condition	Security	Present	Open	Height
1	MW-2A	Above-ground	Steel	Bent	Hinged	Bent	None	*	*	*
2	MW-2B	Above-ground	Steel	Good	Hinged	Bent	Lock	Yes	Yes	4"
3	MW-2R	Above-ground	Steel	Good	Cap	Intact	Lock	No	*	*
4	MW-3	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
5	MW-4	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	4"
6	MW-11A	Above-ground	Steel	Good	Cap	Intact	Lock	Yes	Yes	2"
7	MW-11B	Above-ground	Steel	Damaged	Hinged	Intact	Lock	*	*	*
8	MW-14	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
9	MW-15	*	*	*	*	*	*	*	*	*
10	MW-19	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
11	MW-24A	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
12	MW-24B	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
13	MW-25A	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
14	MW-25B	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
15	MW-31B	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
16	MW-32A	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
17	MW-32B	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
18	MW-33A	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
19	MW-33B	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
20	MW-34B	*	*	*	*	*	*	*	*	*
21	MW-35B	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
22	MW-39A	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	4"
23	MW-39B	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	4"
24	FBCSA MW-5	Flush-mount	Steel	Good	Steel Lid	Intact	Bolts	NA	NA	NA
25	GM-1	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
26	GM-2	Above-ground	Steel	Moderate	Hinged	Intact	Lock	Yes	Yes	2"
27	HW-1	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
28	LPZ-4s/4d	Flush-mount	Steel	Good	Steel Lid	Intact	Bolts	NA	NA	NA
29	LPZ-5	Flush-mount	Steel	Good	Steel Lid	Intact	Bolts	NA	NA	NA
30	OBW-1	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
31	OBW-2	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
32	OBW-3	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
33	VW-1	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
34	VW-2	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"
35	VW-2B	Above-ground	Steel	Good	Hinged	Intact	Lock	Yes	Yes	2"

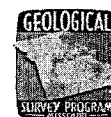
\* See Notes

# Queeny-Solutia, St. Louis



## Division of Geology and Land Survey Operation and Maintenance Well Inspection

Sheet 3

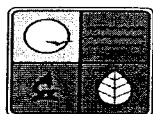


Inspection Date: 8-29-11

MW ID		Bolsters	Riser Pipe		Riser Pipe Cap		
			Composition	Condition	Type	Condition	Water-tight
1	MW-2A	None	PVC	Damaged	J-plug	Good	Yes
2	MW-2B	None	PVC	Good	J-plug	Good	Yes
3	MW-2R	Yes	Steel	Good	*	*	*
4	MW-3	Yes	PVC	Good	J-plug	Good	Yes
5	MW-4	Yes	PVC	Good	J-plug	Good	Yes
6	MW-11A	Yes	PVC	Good	J-plug	Good	Yes
7	MW-11B	Yes	PVC	Poor	*	*	*
8	MW-14	Yes	PVC	Good	J-plug	Good	Yes
9	MW-15	*	*	*	*	*	*
10	MW-19	Yes	PVC	Good	J-plug	Good	Yes
11	MW-24A	Yes	PVC	Good	J-plug	Good	Yes
12	MW-24B	Yes	PVC	Good	J-plug	Good	Yes
13	MW-25A	Yes	PVC	Good	J-plug	Good	Yes
14	MW-25B	Yes	PVC	Good	J-plug	Good	Yes
15	MW-31B	None	PVC	Good	J-plug	Good	Yes
16	MW-32A	Yes	PVC	Good	J-plug	Good	Yes
17	MW-32B	Yes	PVC	Good	J-plug	Good	Yes
18	MW-33A	Yes	PVC	Good	J-plug	Good	Yes
19	MW-33B	Yes	PVC	Good	J-plug	Good	Yes
20	MW-34B	*	*	*	*	*	*
21	MW-35B	Yes	PVC	Good	J-plug	Good	Yes
22	MW-39A	Yes	PVC	Good	J-plug	Good	Yes
23	MW-39B	Yes	PVC	Good	J-plug	Good	Yes
24	FBCSA MW-5	NA	PVC	Good	J-plug	Good	Yes
25	GM-1	Yes	PVC	Good	J-plug	Good	Yes
26	GM-2	Yes	Steel	Good	J-plug	Good	Yes
27	HW-1	None	PVC	Good	J-plug	Good	Yes
28	LPZ-4s/4d	NA	PVC	Good	PVC Cap	Good	No
29	LPZ-5	NA	PVC	Good	PVC Cap	Good	No
30	OBW-1	Yes	PVC	Good	J-plug	Good	Yes
31	OBW-2	Yes	PVC	Good	J-plug	Good	Yes
32	OBW-3	Yes	PVC	Good	J-plug	Good	Yes
33	VW-1	Yes	PVC	Good	J-plug	Good	Yes
34	VW-2	Yes	PVC	Good	J-plug	Good	Yes
35	VW-2B	Yes	PVC	Good	J-plug	Good	Yes

\* See Notes

# Queeny-Solutia, St. Louis



## Division of Geology and Land Survey Operation and Maintenance Well Inspection



Sheet 4

Inspection Date: 8-29-11

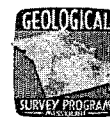
MW ID		Physical Properties Evacuated Water				Well Measurement Audit			
						Facility Measurement		GSP Measurement	
		Color	Odor	Oil/Grease	Turbidity	Depth to Water	Total Depth	Depth to Water	Total Depth
1	MW-2A								
2	MW-2B								
3	MW-2R								
4	MW-3								
5	MW-4								
6	MW-11A								
7	MW-11B								
8	MW-14								
9	MW-15								
10	MW-19								
11	MW-24A								
12	MW-24B								
13	MW-25A								
14	MW-25B								
15	MW-31B								
16	MW-32A								
17	MW-32B								
18	MW-33A								
19	MW-34B								
20	MW-33B								
21	MW-35B								
22	MW-39A					13.53'		13.51'	
23	MW-39B					12.19'		12.18'	
24	FBCSA MW-5								
25	GM-1								
26	GM-2								
27	HW-1								
28	LPZ-4s/4d								
29	LPZ-5								
30	OBW-1								
31	OBW-2								
32	OBW-3								
33	VW-1								
34	VW-2								
35	VW-2B								

\* See Notes

# Queeny-Solutia, St. Louis



## Division of Geology and Land Survey Operation and Maintenance Well Inspection Sheet 5



Inspection Date: 8-29-11

MW ID		Notes
1	MW-2A	No visible surface seal. Protective casing heavily damaged. Bolster broken off. Riser pipe damaged.
2	MW-2B	No visible surface seal. Protective casing lid will not close securely.
3	MW-2R	No visible surface seal around outer casing. Appears to be open bore completion.
4	MW-3	Concret pad broken and heaved, bolsters damaged.
5	MW-4	Bolsters bent.
6	MW-11A	
7	MW-11B	Overgrown with vegetation. Concrete surface seal deteriorated. Protective casing and bolster damaged. Riser pipe damaged.
8	MW-14	Concrete pad in severely cracked.
9	MW-15	Monitoring well MW-15 was located in a lock fenced area not accessible for inspection.
10	MW-19	Gravel covered asphalt at surface. No visible surface seal.
11	MW-24A	Wood frame around pad.
12	MW-24B	Wood frame around pad.
13	MW-25A	
14	MW-25B	
15	MW-31B	
16	MW-32A	
17	MW-32B	
18	MW-33A	
19	MW-34B	Unable to locate monitoring well.
20	MW-33B	
21	MW-35B	
22	MW-39A	
23	MW-39B	
24	FBCSA MW-5	No photo available.
25	GM-1	Gravel washing away from surface seal.
26	GM-2	Gravel washing away from surface seal. Some damage to protective casing.
27	HW-1	Wood frame around pad.
28	LPZ-4s/4d	Two risers in flushmount. This type of completion would require a variance. PVC cap not likely water-tight.
29	LPZ-5	PVC cap not likely water-tight.
30	OBW-1	Asphalt at surface. No visible surface seal.
31	OBW-2	Concrete pad broken and displaced.
32	OBW-3	
33	VW-1	No visible surface seal.
34	VW-2	Overgrown with vegetation.
35	VW-2B	No visible surface seal around outer casing.

## Queeny-Solutia, St. Louis



**Division of Geology and Land Survey**  
**Operation and Maintenance Well Inspection**  
 Sheet 1

Date: 08/29/2011

Location: Queenie-Solutia



Sheet 1

Well ID		Properties of the Surface Well Seal					Visual Well Integrity Inspection					
		Size	%	Sloped	Ponded	Run-Off	Surface Well Seal		Outer Well Casing		Inner Well Casing	
							Type	Condition	Type	Condition	Type	Condition
1	MW-2A	No Pad					Stand	Poor	NA	NA	PVC	Poor
2	MW-2B	No pad					Stand	Moderate	NA	NA	PVC	Good
3	MW-2R	No Pad					Stand	Good	Steel 8"	Good	Steel 6"	Good
4	MW-3	3' x 4'	85	No	Unknown due to damage		Stand	Good	NA	NA	PVC	Good
5	MW-39A	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
6	MW-39B	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
7	LPZ-5	2'	100	Yes	No	No	Flush	Good	NA	NA	PVC	Good
8	LPZ-4S/4D	2'	100	Yes	No	No	Flush	Good	NA	NA	PVC	Good
9	OBW-2	2'	50	Yes	?	?	Stand	Good	NA	NA	PVC	Good
10	OBW-1	2'	75	Yes	No	No	Stand	Good	NA	NA	PVC	Good
11	OBW-3	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
12	MW-19	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
13	GM-2	2'	100	Yes	No	No	Stand	Moderate	NA	NA	Galvanized	Good
14	GM-1	2'	100	Yes	No	No	Stand	Moderate	NA	NA	PVC	Good
15	MW-14	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
16	MW-11B	2'	Unknown				Stand	Poor	NA	NA	PVC	Poor
17	MW-11A	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
18	MW-4	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
19	HW-1	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
20	MW-31B	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
21	MW-32A	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
22	MW-32B	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
23	MW-33A	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
24	MW-33B	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
25	MW-24A	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
26	MW-24B	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
27	MW-35B	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
28	VW-1	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
29	VW-2B	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good
30	VW-2	2'	100	Yes	No	No	Stand	Good	NA	NA	PVC	Good



**Division of Geology and Land Survey**  
**Operation and Maintenance Well Inspection**  
 Sheet 2

Date: 08/29/2011

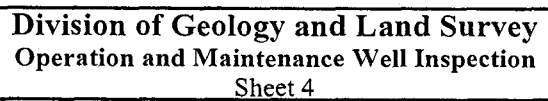
Location: Queenie-Solutia



Sheet 2

Well ID		Accessory Well Information								Notes
		Casing Cap				Drainage Hole				
		Type	Composite	Security	Condition	Weep Hole	Open	Height	Posts	
1	MW-2A	J-Plug		Lock	Good	Stand heavily damaged and broken off.				Heavily Damaged
2	MW-2B	J-Plug		Lock	Good	Yes	Yes	4"	N	Well cover lid doesn't shut securely.
3	MW-2R	No plug, just the steel well lid with a lock				No	No	NA	Yes	No conc. Pad, has 8" o.c., 6" i.c.
4	MW-3	J-Plug		Lock	Good	Yes	Yes	2"	Yes	Concrete is cracked and heaved and bolsters have been damaged.
5	MW-39A	J-Plug		Lock	Good	Yes	Yes	4"	Yes	
6	MW-39B	J-Plug		Lock	Good	Yes	Yes	4"	Yes-	
7	LPZ-5	Cap	PVC	Bolts	Good	Flushmount Surface Seal				
8	LPZ-4S/4D	Cap	PVC	Bolts	Good	Flushmount Surface Seal				Both Piezs. Set in same Flushmount.
9	OBW-2	J-Plug		Lock	Good	Yes	Yes	2"	Yes	Concrete is cracked and displaced.
10	OBW-1	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
11	OBW-3	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
12	MW-19	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
13	GM-2	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
14	GM-1	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
15	MW-14	J-Plug		Lock	Good	Yes	Yes	2"	Yes	Concrete is in poor condition.
16	MW-11B	Heavily Damaged - Information Unknown								Heavily Damaged.
17	MW-11A	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
18	MW-4	Information Unknown								Needs paint, bolster need repair.
19	HW-1	J-Plug		Lock	Good	Yes	Yes	2"	No	
20	MW-31B	J-Plug		Lock	Good	Yes	Yes	2"	No	
21	MW-32A	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
22	MW-32B	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
23	MW-33A	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
24	MW-33B	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
25	MW-24A	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
26	MW-24B	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
27	MW-35B	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
28	VW-1	J-Plug		Lock	Good	Yes	Yes	2"	Yes	
29	VW-2B	J-Plug		Lock	Good	Yes	Yes	2"	Yes	Cover is set in 8" steel casing.
30	VW-2	J-Plug		Lock	Good	Yes	Yes	2"	Yes	

[illegible]



Date \_\_\_\_\_

Location \_\_\_\_\_

[illegible]

[illegible]

[illegible]

[illegible]





**Inspection Photo No. 01 (MW-2A)**



**Inspection Photo No. 02 (MW-2B)**



**Inspection Photo No. 03 (MW-2R)**



**Inspection Photo No. 04 (MW-03)**



**Inspection Photo No. 05 (MW-39A)**



**Inspection Photo No. 06 (MW-39B)**



**Inspection Photo No. 07 (LPZ-5)**



**Inspection Photo No. 08 (LPZ-4S/4D)**



**Inspection Photo No. 09 (OBW-2)**



**Inspection Photo No. 10 (OBW-1)**



**Inspection Photo No. 11 (OBW-3)**



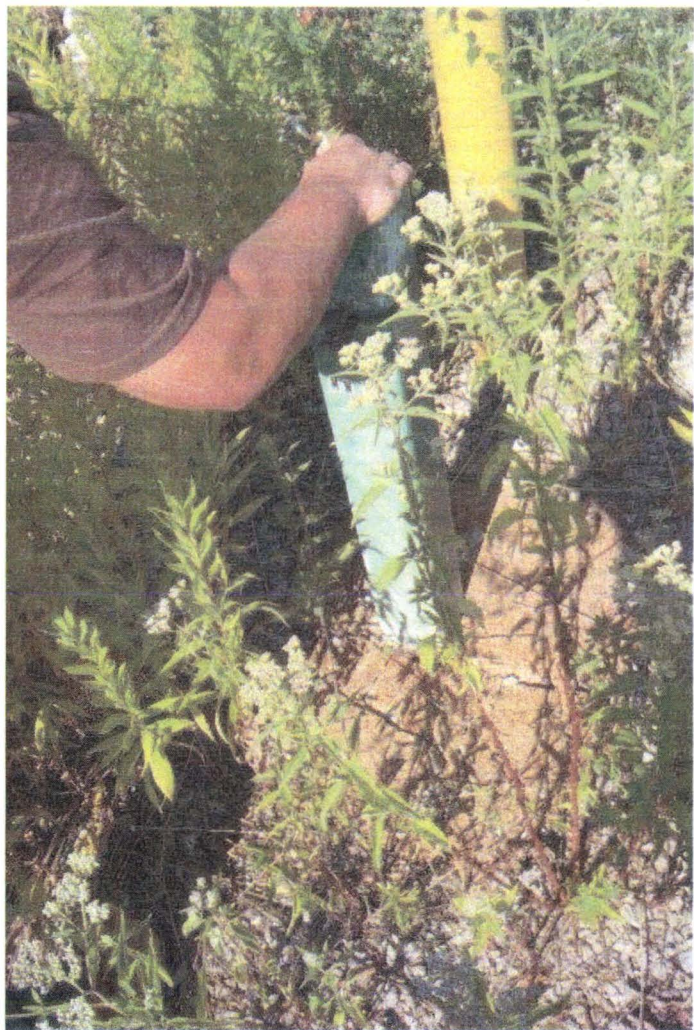
**Inspection Photo No. 12 (MW-19)**



**Inspection Photo No. 13 (GM-2)**



**Inspection Photo No. 14 (GM-1)**



**Inspection Photo No. 15 (MW-14)**



**Inspection Photo No. 16 (MW-11B)**



**Inspection Photo No. 17 (MW-11A)**



**Inspection Photo No. 18 (MW-4)**



**Inspection Photo No. 19 (HW-1)**



**Inspection Photo No. 20 (MW-31B)**



**Inspection Photo No. 21 (MW-32A)**



**Inspection Photo No. 22 (MW-32B)**



**Inspection Photo No. 23 (MW-33A)**



**Inspection Photo No. 24 (MW-33B)**



**Inspection Photo No. 25 (MW-24A)**



**Inspection Photo No. 26 (MW-24B)**



**Inspection Photo No. 27 (MW-35B)**



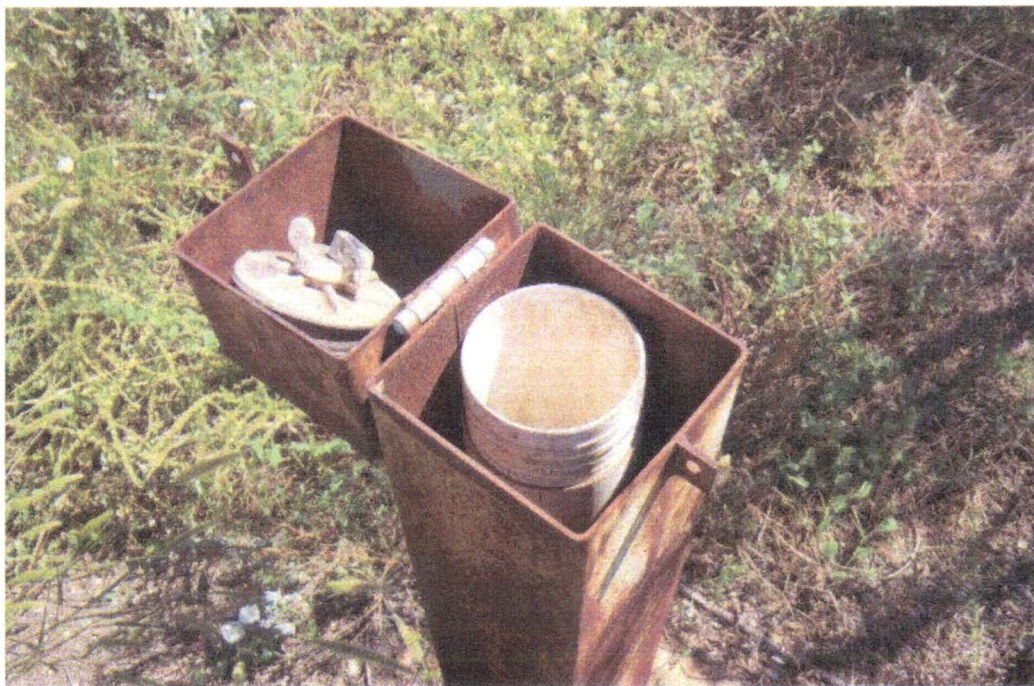
**Inspection Photo No. 28 (VW-1)**



**Inspection Photo No. 29 (VW-2B)**



**Inspection Photo No. 30 (VW-2)**



**Inspection Photo No. 31 (MW-25A)**



**Inspection Photo No. 32 (MW-25B)**

**Appendix F**

**RCRA Operations and Maintenance Sampling Audit Report  
(Prepared by the Missouri Department of Natural Resources  
Environmental Services Program)**

# **RCRA Operation and Maintenance Sampling Audit Report**

**Environmental Operations, Inc  
Former Solutia, John F. Queeny Plant  
201 Russell Blvd.  
City of St. Louis, MO  
CAS Order ID 110907002**

**RECEIVED**

**OCT 25 2011**

**HAZARDOUS WASTE PROGRAM  
MO DEPT. OF NATURAL RESOURCES**

**September 6, 2011**

**Prepared For:**

**Missouri Department of Natural Resources  
Division of Environmental Quality  
Hazardous Waste Program**

**Prepared By:**

**Missouri Department of Natural Resources  
Division of Environmental Quality  
Environmental Services Program**

## Table of Contents

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Appendix A: Sampling and Analysis Procedures Field Audit Worksheet

Appendix B: Field Notes

Appendix C: Chain of Custody

Appendix D: Analytical Results

## **1.0 Introduction**

The Missouri Department of Natural Resources (MDNR), Hazardous Waste Program (HWP) requested the MDNR, Environmental Services Program (ESP) to conduct a RCRA Operation and Maintenance Sampling Audit at the Environmental Operations (former Solutia, John F. Queeny Plant) facility located in St. Louis, MO.

On September 6, 2011, ESP Environmental Specialist Pam Hackler conducted the RCRA operation and maintenance audit by splitting groundwater samples with Jon Truesdale of Environmental Operations, Incorporated who was performing the sampling. Ken Hannon of ESP assisted in collecting the samples. Another individual representing MDNR present on the same day but performing other surveys was Christine Kump of MDNR Hazardous Waste Program.

## **2.0 Site Information**

### **2.1 Location**

The Environmental Operations property, formerly Solutia, John F. Queeny Plant, is a semi-secure area. All wells are located within the gated areas of the facility however numerous holes in the fencing exist. The facility encompasses approximately 38 acres, bound on the north by Carroll Street and Lafayette Avenue, on the east by Missouri Pacific Railroad and the Mississippi River, the south by Victor and Barton Streets, and on the west by Third Street. This is an industrialized area of St. Louis.

### **2.2 Description, History, and Contaminants of Concern**

The facility began operations in 1901 and has manufactured over 200 products from over 800 different raw chemicals. The facility ceased production operations in 2006. Products previously manufactured at the plant include but are not limited to maleic anhydride, fumaric acid, toluene, sulfonic acid, paranitrophenetole, phthalates, synthetic functional fluids, salicylic acid, aspirin, methyl salicylate, benzoic acid, ethavan, pesticides, and herbicides.

Current known contaminants at the site include but are not limited to tetrachloroethene (PCE) and its degradation products trichloroethene (TCE), cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride, dense non-aqueous phase liquids (DNAPL), light non-aqueous phase liquids (LNAPL), chlorobenzene, trichlorocarbonyl, polychlorinated biphenyls (PCBs), alachlor, chlorobenzene, benzene, and ethylbenzene. Allegedly, the site also has buried debris, such as vehicles, which influence the monitoring well network.

ESP was asked to obtain samples for volatile organic compounds, the dissolved gasses methane, ethane, ethene, and carbon dioxide, chloride, nitrate as N, sulfate, alkalinity, sulfide, total dissolved solids, and total organic carbon.

### **3.0 Methods**

#### **3.1 Field Procedures**

A summary of the field procedures used by the personnel collecting the groundwater samples is provided below. The attached Sampling and Analysis Procedures Field Audit Worksheet (Appendix A) details the field procedures of the sampling personnel. A copy of the field notes taken while on scene is attached as Appendix B.

The Environmental Operations sampling personnel sampled five groundwater monitoring wells during ESP's visit. Each well used the same peristaltic pump to remove the groundwater. Field measurements for pH, temperature, oxidation-reduction potential, percent and absolute dissolved oxygen, and specific conductivity were taken on all five wells by the facility personnel and ESP. Additionally, ESP acquired turbidity measurements on the purge and sample water. Facility personnel used a flow-through cell to determine field measurements and ESP utilized a cup to determine a discrete field measurement.

Sample collection was performed using the same apparatus used in well evacuation. Sample containers were filled directly from the sampling apparatus to the sample containers. Samples were taken in proper procedural order by ESP with volatile organic compounds first, dissolved gasses second, total organic carbon (TOC) third, sulfide fourth, nitrate fifth, and then filling one Nalgene liter container for alkalinity, total dissolved solids, chloride, and sulfate. Facility personnel were mistaken in the analysis for which the bottles were labeled, although facility personnel believed they were filling TOC third and dissolved metals last, the facility was sampling dissolved metals third and TOC last.

#### **3.2 Chain of Custody**

All split samples collected by ESP personnel received a unique numbered label. The chain of custody (Appendix C) form denotes the location, field measurements (pH, conductivity, ORP, dissolved oxygen, turbidity, and temperature), analyses requested, date and time of collection, and signatures of the sample collector and the sample receiving personnel. All samples were placed in the appropriate containers, and preserved according to MDNR-ESP-001, were stored on ice in a cooler and were transferred to refrigeration upon arrival at the ESP laboratory.

#### **3.3 Requested Analysis**

All split samples collected were submitted to the ESP laboratory (September 7, 2011) one day after sampling, and were analyzed for volatile organic compounds, methane, ethane, ethene, carbon dioxide, chloride, nitrate, sulfate, sulfide, alkalinity, total organic carbon, and total dissolved solids. The sulfide chemical analysis was contracted to PDC of Peoria, IL, however, the ESP laboratory was unable to ship the containers before the holding time had expired; the analysis was still completed with an exception noted the samples were analyzed past the holding time. TestAmerica in Austin TX was the contract laboratory which analyzed for the dissolved gasses methane, ethane, ethene, and carbon dioxide.

Sample #	Day & Time	Sample Location	Analysis Requested
1106736	9/6/2011 n/a	Trip Blank	VOA, TOC
1106737	9/6/2011 1147	LPZ-5	All*
1106738	9/6/2011 1412	OBW-1	All*
1106739	9/6/2011 1540	REC-4	All*
1106740	9/6/2011 n/a	REC-4 Duplicate	All*
1106756	9/6/2011 1725	MW-24B	All*
1106757	9/6/2011 1840	MW-24A	All*

\* Analysis requested: VOA (method SW 846 8260), TDS (method EPA 160.1), ALK (method EPA 310.2), Nitrate as N (method EPA 353.2), Sulfate (method EPA 375.2), Sulfide (method EPA 376.2 [contract lab]), Chloride (method SM 4500-Cl-E), TOC (method SM 5310-B), and dissolved gasses Methane, Ethane, Ethene, and Carbon Dioxide (contract lab).

### 3.4 Data Quality

To help ensure precise, accurate, representative, complete, and comparable data were achieved, all field work was conducted in accordance with the FY 2012 "WORKPLAN for O&M Split Sampling Events". Unless otherwise noted, ESP field personnel followed established MDNR standard operating procedures. OBW-1 was sampled in place of MW-38A because the adjacent landowner denied access to the property where the well is located; OBW-1 was the preferred alternate for MW-38A.

All field personnel including MDNR wore a pair of clean disposable nitrile gloves for each new well and changed as frequently as needed while setting up, purging, and taking samples to minimize possibilities of cross contamination. Observations of the sampling event were recorded in the Sampling and Analysis Procedures Field Audit Worksheet (Appendix A) and a permanent field notebook, copied, and attached as Appendix B. All samples were collected in clean glass or Nalgene containers and were preserved in accordance with standard operating procedure MDNR-ESP-001. Sample 1106740 is a duplicate sample of sample 1106739; well REC-4.

### 4.0 Investigation Derived Waste

Disposable nitrile gloves and paper towels were placed in a refuse container at the ESP building. Otherwise, there was no disposable sampling equipment generated by ESP personnel.

### 5.0 Observations

The weather at the site was sunny, approximately 65 to 80 degrees Fahrenheit, and winds were very strong.

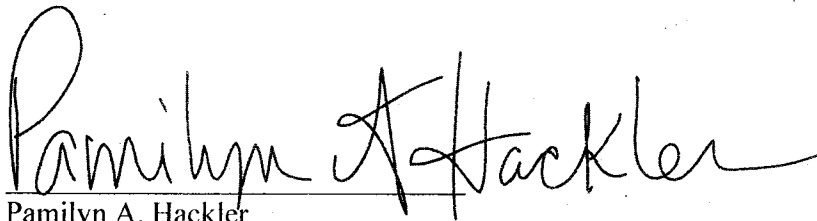
### 6.0 Reporting

Appendix A is the Sampling and Analysis Procedures Field Audit Worksheet; please refer to this document for specificities of the sampling procedures for each well, field measurements, and

RCRA O&M Report  
Environmental Operations, Inc.  
Former Solutia, John F. Queeny Plant  
St. Louis City  
September 6, 2011  
Page 4

chemical analysis procedures. Appendix B is a copy of the field notes taken by ESP staff including the field measurements obtained using field services equipment and field measurements obtained by the facility sampling personnel. Appendix C is the chain of custody used by ESP staff, and please see Appendix D for analytical results.

Submitted by:



Pamilyn A. Hackler  
Environmental Specialist  
Field Services Unit  
Environmental Services Program



Digitally signed by Eric Sappington  
DN: cn=Eric Sappington, c=US,  
o=Missouri Department of Natural  
Resources, ou=ESP-EER,  
email=eric.sappington@dnr.mo.gov  
Date: 2011.10.25 12:50:43 -05'00'

Approved by:

Eric J. Sappington  
Unit Chief  
Field Services Unit  
Environmental Services Program

ES:phd

c: Bruce Stuart, HWP  
Bill Fanska, HWP  
Christine Kump, HWP  
Terry Hawkins, DGLS  
Brenna McDonald, DGLS  
Peter Bachle, DGLS

**Appendix A:**  
**Sampling and Analysis Procedures Field Audit Worksheet**  
**RCRA O&M Report**  
**Environmental Operations, Inc**  
**September 6, 2011**

**RCRA Operation and Maintenance (O & M) Field Audit  
Sampling and Analysis Procedures Field Audit Worksheet  
Prepared by the MDNR Environmental Services Program**

**Facility Name and Address:** Environmental Operations, Incorporated  
Former Solutia, John F. Queeny Plant  
201 Russell Blvd.  
St. Louis, MO

**Date(s) of Sampling:** September 6, 2011

**Lab Name and Address:** Pace Analytical Services, Inc.  
9608 Loriet Blvd.  
Lenexa, KS

**Phone Number:** 913-599-5665

**Participants:**

Name	Position	Representing
Pam Hackler	Environmental Specialist	MDNR, ESP
Ken Hannon	Environmental Specialist	MDNR, ESP
Jon Truesdale	Geologist	Environmental Operations, Inc.
Christine Kump	Environmental Engineer	MDNR, HWP

**I. Review of Sampling and Analysis Procedures**

**1. Prior to Well Evacuation (ESP use only if DGLS has not evaluated):**

*DGLS evaluated this section: 1 a. to 1 h.*

- a. Are the well numbers clearly marked on the well?  
If yes, how are they marked and where?
- b. Were measures taken to prevent evacuation/sampling equipment from contacting potentially contaminated surfaces?  
If yes, what measures?
- c. Were static water levels measured?
- d. Were total well depths measured?

- e. Are measurements taken to the nearest 0.01 foot?
- f. Is there a permanent depth measurement reference point at each well?
- g. Description of depth measuring device used (type, manufacturer, model):
- h. Was depth measuring device cleaned and dried after each measurement?  
If yes, describe decontamination procedure:

**2. Detection/Sampling of Immiscible Layers (ESP use only if DGLS has not evaluated):**

- a. Are procedures used which will detect light phase immiscible layers?  
If yes, describe.  
*Yes, an interface probe was used to detect for light phase immiscible layers.*
- b. Are procedures used which will detect dense phase immiscible layers?  
If yes, describe:  
*Yes, an interface probe was used to detect dense phase immiscible layers.*
- c. Are any detected immiscible layers sampled separately prior to well evacuation?  
If yes, describe the procedure:  
*No, immiscible layers were not sampled separately.*
- d. Do the procedures used minimize mixing with the aqueous phase?  
*Yes, the facility monitored for light phase immiscible layers during sampling; as in the case of MW-24A, there was a LNAPL present and facility personnel checked at each interval measurement the distance between the layer and the end of the pump tubing. The sampling commenced before the layer was within about 2 feet of the pump tubing.*

**3. Well Evacuation (ESP use only if DGLS has not evaluated):**

- a. Are low yielding wells evacuated to dryness?  
*No, low flow purging and sampling techniques are used.*
- b. Are high yielding wells evacuated until the parameters of pH, temperature, and specific conductance have stabilized to  $\pm 10\%$  over two successive well purge volumes?  
*All wells were purged until at least three consecutive field measurements (using pH, temperature, conductivity, dissolved oxygen and oxidation-reduction potential) stabilized regardless of the well volume which had been purged.*

c. If no to "b", are at least three well casing volumes purged from high yielding wells?  
*No, three well volumes were not purged.*

d. Describe field method used to calculate the volume of evacuated water:  
*For each well, a well log sheet was maintained; the sampler used a variable flow peristaltic pump, based on the time the pump was running, the volume of the water was calculated.*

e. Describe field method used to measure the volume of evacuated water:  
*Evacuated water flowed into a volumetric measuring cup and the volume of evacuated water was measured visually after a specific amount of time passed.*

f. Describe procedure used for collection, management, and disposal of evacuated water:  
*Evacuated water that was not used for sampling was placed in five gallon buckets, then transferred to a waste drum on site. The drum will be picked up by a hazardous materials contractor when full (the contractor changes periodically).*

g. Does each well have dedicated evacuation equipment?  
*Yes, each well had single-use dedicated tubing; the peristaltic pump was reused but does not come in contact with any groundwater.*

h. Describe well evacuation equipment (type, composition, manufacturer, model, etc.) including delivery lines used to lower equipment into well:  
*The pump was a GeoTech GeoPump 2 peristaltic pump, the tubing through the pump was MasterFlex flexible tubing, the withdrawal tubing was 1/8<sup>th</sup> inch polyethylene tubing.*

i. Describe the decontamination procedure used for non-dedicated evacuation equipment:  
*No evacuation equipment required decontaminating.*

j. Describe the physical properties of the evacuated water:

Well number	LPZ-5	OBW-1	REC-4	MW-24B	MW-24A
Color	Dark grey	Almost clear	Clear	Clear with black particles	Very pale yellow
Oil/Grease	No Layers Observed	No Layers Observed	No Layers Observed	No Layers Observed	No Layers Observed
Turbidity	102 ntu	3.44 ntu	7.67 ntu	31.3 ntu	19.3 ntu

4. Sample Withdrawal (ESP use only if DGLS has not evaluated):

- a. In what sequence were the wells sampled?  
*The wells were sampled in LPZ-5, OBW-1, REC-4, MW-24B, and MW-24A order.*
- b. Were wellbore fluid levels checked in low yield wells prior to sample collection to determine if sufficient fluid was available to sample for the parameters of concern?  
*Yes, fluid levels were checked in all wells prior and during purging and at sampling.*
- c. Were low yield wells sampled as soon as sufficient wellbore fluid volume was available?  
*Yes, fluid levels were sufficient because the facility was using low-flow sampling techniques.*
- d. For low yield wells, on average how much time elapsed between well purging and sampling?  
*No time elapsed between purging and sampling.*
- e. Were wellbore fluid levels checked in high yield wells prior to sample collection to determine the percent recovery of wellbore fluids?  
*Yes, wellbore fluid levels were checked in high yield wells prior to sample collection. After sampling, field personnel calculate percent recovery based on field data sheets.*
- f. According to the facility's sampling personnel, approximately what percent fluid recovery is deemed adequate prior to sampling high yield wells?  
*Not applicable, low-flow sampling methods are used, and high yield wells by definition need not recover after evacuation.*
- g. Were high yield wells allowed to achieve this percent recovery prior to sample collection?  
*Not applicable.*
- h. For high yield wells, on average how much time elapsed between well purging and sampling?  
*No time elapsed between sampling and purging of any wells on site.*
- i. Describe well sampling equipment (type, composition, manufacturer, model, etc.) including delivery lines used to lower equipment into the well:  
*The pump was a GeoTech GeoPump 2 peristaltic pump, the tubing through the pump was MasterFlex flexible tubing, the withdrawal tubing was 1/8<sup>th</sup> inch polyethylene tubing.*
- j. Does each well have a dedicated sampling device?  
*Yes, although the pump was reused, it is not in contact with any groundwater; the*

*tubing was single use. However, the water level indicator was decontaminated between wells.*

- k. If no to "j", is non-dedicated equipment decontaminated between wells?  
*Yes, non-dedicated equipment was decontaminated between wells.*
- l. Describe the decontamination procedure used for non-dedicated sampling equipment:  
*The water level indicator is dipped in Alconox solution and then rinsed with distilled water.*
- m. Is non-dedicated sampling equipment thoroughly dried before each use?  
*The water level indicator was not dried.*
- n. For non-dedicated sampling equipment, were equipment blanks collected to monitor for potential sample cross-contamination?  
*No equipment blanks were collected.*
- o. If yes to "n", how frequently were equipment blanks collected?  
*Not applicable.*
- p. Describe the procedure used to collect equipment blanks:  
*Not applicable.*
- q. Were duplicate samples collected?  
*Yes, duplicate samples were reportedly collected but not while ESP staff were present on site.*
- r. If yes to "q", how frequently are duplicate samples collected?  
*Duplicate samples were reportedly collected for every ten true samples collected.*
- s. Describe the duplicate sampling procedures:  
*Reportedly, the containers were filled at the same time for the true sample and the duplicate sample.*
- t. Was care taken to avoid placing clean sampling equipment on the ground or other potentially contaminated surfaces prior to use?  
*There were a few observations of the sampling personnel placing the sampling equipment on potentially contaminated surfaces. The sampling personnel placed most of the sampling equipment on a table, the water level indicator was either hung on the well casing or placed on the cement or grass next to the well head. The sampling personnel placed the 1/8 inch tubing on the ground while it was being placed in the well; this could have introduced contamination into the groundwater.*

- u. If bailers were used, were they lowered and raised slowly enough to prevent sample degassing or volatilization of sensitive parameters?  
*Not applicable, bailers were not used.*
- v. If volatile organics were sampled with a pump, was the sample collection pump rate at or below 100 ml/minute?  
*No, not all volatile organic samples were collected at less than 100 mL per minute.*
- w. If no to "v", what was the sample collection pump rate?  
*LPZ-5 was sampled at 80 mL/min, OBW-1 sampled at 120 mL/min, REC-4 was sampled at 225 mL/min, MW-24B was sampled at 170 mL/min and MW-24A was sampled at 150 mL/min.*
- x. Were samples transferred directly from the sampling device to the sample containers?  
*Yes, samples were transferred directly from the sampling device to the sample containers.*
- y. Describe the sample transfer procedure:  
*All samples were collected after the flow through cell had been removed and were filled directly from the extraction tubing.*
- z. Describe the method used to obtain split samples:  
*Containers were filled with agencies alternating filling containers.*
- aa. Overall, were samples collected in a manner that would minimize changes in the sample due to adsorption, aeration, agitation, volatilization, etc.?  
*Generally, the samples overall were collected in a manner to minimize changes in the sample due to adsorption, aeration, agitation, and volatilization, see 4.bb.*
- bb. If no to "aa", describe any potential problems observed:  
*At LPZ-5 the pump was flowing backwards bubbling into the well for about one minute which could have volatilized some sensitive parameters. Four of the five wells (listed in 4.w.) were sampled above 100 mL/minute. Also, the Environmental Protection Agency "RCRA Groundwater Monitoring" November 1992 draft technical guidance 7.3.2.6 suggests that peristaltic pumps are not suitable for collecting volatile organic samples.*
- cc. Were samples collected and containerized in the order of site-specific parameter's volatilization sensitivity (e.g., in descending order – VOA, TOX, TOC, semi-volatiles, metals and cyanide, major water quality cations and anions, radionuclides)?  
*ESP's samples were taken in proper procedural order with volatile organic compounds first, dissolved gasses second, total organic carbon (TOC) third, sulfide fourth, nitrate fifth, and then filling one Nalgene liter container for alkalinity, total dissolved solids, chloride, and sulfate. The facility sampling personnel filled VOA*

*vials first, dissolved gasses second, metals third, sulfide fourth, then total organic carbon last; see 5.a. and 5.b.*

dd. Were samples collected for dissolved metals?

*Yes, samples were reportedly collected for dissolved metals.*

ee. If yes to "dd", were the samples field filtered using a 0.45 micron filter?

*No, samples were not field filtered.*

ff. If yes to "dd", but no to "ee", please explain:

*The facility's sampling personnel did not field filter the sample for metals nor were they preserved with any acid.*

gg. List any parameters measured in the field by the facility:

*Facility sampling personnel collected data on pH, temperature, dissolved oxygen (percentage and absolute), oxidation reduction potential, and specific conductivity.*

hh. Describe the equipment (type, manufacturer, model) used by the facility for taking field measurements:

*The facility sampling personnel used a rented YSI-556 handheld multi-parameter system. Number R6209 rented from Ashtead Technologies (800-242-3910). The water level indicator/interface probe was a Heron Instruments number 185908 20 meter "ms.oil" interface meter.*

ii. List the values for any field measurements taken by the facility:

Well number	LPZ-5	OBW-1	REC-4	MW-24B	MW-24A
pH	8.05	10.62	6.35	6.53	6.29
Temperature (°C)	21.02	21.76	21.46	23.54	20.07
Specific Conductivity (mS/cm)	3.888	1.971	2.596	2.379	1.591
Dissolved Oxygen (%)	33.9	57.5	30.5	10.3	8.9
Dissolved Oxygen (mg/L)	2.97	5.01	2.67	0.86	0.80
Oxidation-Reduction Potential (mV)	-207.6	-19.7	-53.2	-123.6	-101.6

jj. Describe all field equipment calibration and maintenance procedures:

*Calibration of the water quality meter took place the morning of the sampling event. However, during sampling, ESP and facility's measurements varied significantly for oxidation-reduction potential in the first well. ESP expected all comparative field measurements to vary to some extent since the facility was using a flow-through cell and ESP was capturing purge water in a cup and taking separate measurements. ESP asked the facility to check the meter's calibration in a standard ORP solution, the reading was 223 mV in a 200 standard solution. This is 10.4 percent variance from the standard solution. ESP's reading was 198 mV which was 1 percent variation from the standard solution. Facility personnel did not recalibrate their water quality instrument.*

kk. Are the procedures under "jj" performed pursuant to the manufacturer's recommendations and consistent with accepted protocol (e.g., SW-846)?

*Daily calibration is recommended, however, a recalibration should have been performed at the time the ORP measurements were noticed to be significantly different than the standard solution.*

ll. Is a field logbook and/or individual well sampling sheets maintained?

*Yes, individual well sampling sheets were maintained "well development/purging and sampling record" and "site daily report" were filled out daily.*

mm. Are the following items documented in either or both of the above:

- i. Date and time of sampling? *Yes.*
- ii. Weather conditions? *Yes.*
- iii. Field sampling participants? *Yes.*
- iv. Observations and physical well integrity? *Yes.*
- v. Field equipment descriptions? *No. In this case, the facility's meter broke the morning of the sampling event and one was rented from a local environmental supply company; this was not noted anywhere on the forms.*
- vi. Field analysis results? *Yes.*
- vii. Field equipment and calibration/maintenance information? *No.*
- viii. Any other pertinent field observations or unusual conditions? *Yes.*

nn. Who maintains the field logbook/well sampling sheets?  
*The facility's sampling personnel.*

oo. Describe the physical properties of the groundwater samples:

Well Number	LPZ-5	OBW-1	REC-4	MW-24B	MW-24A
Color	<i>Cloudy amber</i>	<i>Clear</i>	<i>Clear but light yellow</i>	<i>Clear with black particles</i>	<i>Very pale yellow</i>
Oil/Grease	<i>None visible</i>	<i>None visible</i>	<i>None visible</i>	<i>None visible</i>	<i>None visible</i>
Turbidity	<i>12.9 ntu</i>	<i>2.08 ntu</i>	<i>11.3 ntu</i>	<i>19.3 ntu</i>	<i>9.3 ntu</i>

## 5. Sample Preparation and Handling:

- a. List the sample containers and preservation methods used by the facility for each parameter or group of parameters to be analyzed:

Parameter/Group	Sample Container	Preservation
VOA	(3) 40 mL clear VOA vials	Ice
TOC*	(1) 1 L Nalgene bottle	Ice
Dissolved gasses	(3) 20 mL clear Teflon septum vials	Ice
Sulfide	(1) 250 mL Nalgene bottle	ZnAcetate and NaOH, Ice
Dissolved Fe & Mn*	(1) 250 mL amber glass bottle	H <sub>2</sub> SO <sub>4</sub> and Ice

\* See 5.b.

- b. Were the sample containers utilized for specific parameters consistent with current guidance (e.g., SW-846)?  
*No, sample containers did not match the analysis to be performed. Sampling personnel incorrectly identified which containers went with which analysis meaning the facility's personnel did not collect the parameters in the correct volatilization order. In the table above (5.a.), TOC and dissolved metals containers should be switched.*
- c. Were any of the sample containers pre-cleaned prior to use (i.e., solvent-rinsed, baked, etc.)?  
*Sample containers came from the contracted lab; it is unknown if they pre-clean the containers.*
- d. Were the samples preserved in accordance with current EPA-approved procedures?  
*Yes, samples were preserved according to EPA-approved methods; however see 5.a. and 5.b.*
- e. If any non-EPA preservation methods were used, list the source(s) from which these methods were derived:  
*Not applicable.*
- f. Were sample containers pre-preserved or were preservatives added in the field?  
*Sample containers came pre-preserved from the lab.*
- g. Were the sample containers labeled?  
*No, sample containers were not labeled. The facility's sampling personnel labeled a resealable plastic bag with the well number. Container labels were provided from Pace Analytical Laboratories and were present in the sampling personnel's vehicle.*
- h. Do the sample labels provide the following information:  
*Sample labels were not affixed to the sample containers.*
  - i. Sample identification number? *Yes.*

- ii. Well number? *No.*
- iii. Name of collector? *Yes.*
- iv. Date and time of collection? *Yes.*
- v. Facility name? *Yes.*
- vi. Parameter analyses requested? *Yes.*
- i. Do the sample labels remain legible when wet?  
*Unknown, the sample labels were not affixed to the sampling containers.*
- j. Is a chain-of-custody record included with each sample?  
*The chain of custody was included in the packet from Pace Analytical Laboratory but was not filled out.*
- k. Does the chain-of-custody record document the following:
  - i. Sample identification number? *Yes.*
  - ii. Well number? *No.*
  - iii. Signature of collector? *Yes.*
  - iv. Date and time of collection? *Yes.*
  - v. Sample container and preservative type? *Yes.*
  - vi. Number of containers? *Yes.*
  - vii. Parameter analyses requested? *Yes.*
  - viii. Signature of all persons involved in the chain-of-possession? *Yes.*
  - ix. Inclusive dates of possession? *Yes.*
- l. Was the headspace completely eliminated from containers used to collect samples for volatile organic analyses?  
*Yes, headspace was completely eliminated when collecting samples in VOA vials and dissolved gas vials.*
- m. Is at least one trip blank prepared for each sample container type to verify sample container cleanliness and field handling methods?

*Yes, trip blanks were prepared.*

- n. If no to "m", were any trip blanks prepared?

*Not applicable.*

- o. If yes to "n", in what containers and how many?

*Not applicable.*

- p. What type of laboratory is used for the sample analyses (e.g., on-site in-house, off-site in-house, off-site contractor)?

*The laboratory was an off-site contracted laboratory.*

- q. How are the samples maintained prior to analyses (i.e., refrigerated, secured, etc.)?

*All samples remain on ice in the custody of the sampling personnel until being picked up by the contract laboratory. Custody is transferred to the driver or the cooler is custody sealed for transport.*

- r. How long are samples held prior to transport to the laboratory?

*Samples are usually only held one day before transport.*

- s. How are the samples transported/shipped to the laboratory (i.e., hand delivered, overnight express, etc.)?

*The samples were hand delivered.*

- t. If the samples are not hand delivered, are sample seals attached to the containers or coolers to ensure that the samples are not tampered with while in transit?

*Not applicable.*

## 6. Quality Assurance/Quality Control

In completing this portion of the O & M Field Audit checklist, the Hazardous Waste Program feels that the auditor should contact the responsible laboratory directly for a response to the following questions, realizing that the resulting response must be taken as fact. This procedure is recommended since the O & M Field Audit is not intended as a laboratory audit, but the overall content of the report would not be complete without the answers to the following:

*This portion of the worksheet filled out by Charles Girgin of Pace Analytical Labs.*

- a. Are laboratory logbooks maintained to track all phases of laboratory procedure from sample receipt through analysis, reporting, and disposition?

*Yes, the Laboratory utilizes logbooks and LIMS.*

- b. Do the logbooks document the following:

- i. Client name? *Yes*
  - ii. Date and time of sample receipt? *Yes*
  - iii. Sample number and analysis to be performed? *Yes*
  - iv. Observation of damaged/irregular samples received? *Yes*
  - v. Sample preparation methods (e.g. extraction)? *Yes*
  - vi. Date and time of sample analysis initiation and completion? *Yes*
  - vii. Name of person performing each analytical step? *Yes*
  - viii. All QA/QC sample results? *Yes*
  - ix. Instrument calibration information? *Yes*
- c. Describe all procedures used to ensure integrity of the samples in the laboratory prior to analysis:  
*The laboratory is a secure facility and the customer entrances are monitored during working hours. The project samples are stored in cold storage at 4° C ± 2° C or according to the analytical method prior to analysis. All samples are handled according to NELAC Quality system requirement.*
- d. Are all samples analyzed within EPA-specified holding times (e.g. SW-846)?  
*Yes.*
- e. If no to "d", are holding time overruns reported on the final analysis results sheets?  
*Yes.*
- f. Are all samples analyzed using an EPA-approved analytical method for each parameter?  
*Yes.*
- g. Is the analytical method used for each parameter documented?  
*Yes.*
- h. If a new analytical method is used, is it documented, with split samples and analyzed using the old method for comparison purposes?  
*Yes.*
- i. If any non-EPA analytical methods are commonly used, list the method(s) and their source document(s):  
*No non-EPA methods are currently employed.*
- j. For replicate analyses (e.g., TOC, TOX), describe the lab method used to obtain the individual concentration values:  
*For EPA 9060, 4 replicates are performed with the average and range reported.*

- k. Are appropriate QA/QC measures used in laboratory analyses (e.g., blanks, matrix spikes, standards, etc.)?

*Yes.*

- l. Are detection limits and percent recovery for matrix spikes or controls reported for each sample parameter?

*Yes.*

**Appendix B:**  
**Field Notes**  
**RCRA O&M Report**  
**Environmental Operations, Inc**  
**September 6, 2011**

Environmental Operations, Inc.  
(former Solutia John F  
Queeny Plant)

FERDM  
NJ00 SOLU

Trip Blank 1106736

Sept 6, 2011

w/ Ken Hannon  
& John Truesdale  
Environmental Operations

YSI Pro-ODO # 09H101046  
Barometric Pressure 30.19 inHg  
Saturated DO check 100.4%

Martini Instruments  
215 mV in 200 mV standard

ExStik II #160293  
1455 in 1413 mS Solution  
7.08 pH in 7.00 Std  
10.17 pH in 10.00 Std

HACH 2100P Turbidimeter  
3.28 NTU in 1-10 NTU Std.  
#4650000  
40.0 NTU in 1-100 NTU Std.  
483 NTU in 1-1000 NTU Std.

LPZ-5

place tubing at 14.5 feet  
screened interval at 10 foot but  
obstruction at about 15 foot

pump - peristaltic -  
running wrong way for about  
one minute, possible volatilization  
of sensitive parameters

takes flow measurement

dark grey plunger

flow rate 110 ml / minute

flow-through cell hooked up

from bottom to top correct

replaced flow-through cell

(other one leaking)

80 ml / min

checked drawdown

Chris Kump - HWD

1128

8.05 pH  
 -10 mV  
 13.4 AS-DO %  
 1.08 mg/L  
 102 NTU  
 22.5 °C  
 3.67 mS

pH  $\pm 0.2$   
 Cond  $\pm 10\%$   
 Temp  $\pm 0.5$

1126

8.3  
 21.3 °C  
 3.74  
 -58 mV  
 12.6 % DO  
 1.08 mg/L DO  
 102 NTU

Strange odor - not solvent but  
 similar

Facility

7.92  
 -157.9 mV  
 34.4 %  
 3.03 mg/L

20.79 °C  
 3.903 mS/cm

7.95 pH  
 20.83 °C  
 3.898 mS/cm  
 -172.3  
 32.8 % DO  
 2.89 mg/L

Containers from Pace Analytical  
 will be picked up either after  
 sampling or in the morning  
 are sending Ferrus (dissolved)  
 and Mn (dissolved) to the lab  
 instead of field testing

1131

7.99  
 20.93 °C  
 3.902 mS/cm  
 -188.9 mV  
 33.3 % DO  
 2.13 mg/L DO

1136

8.39 pH  
 21.6 °C  
 3.65 mS/cm  
 -46 mV  
 9.9 % DO  
 0.83 mg/L  
 12.9 NTU

8.05  
 21.02 °C  
 3.888 mS/cm  
 -267.6 mV  
 33.9 % DO  
 2.47 mg/L DO

Sample 1106737  
 1147 h

Dissolved gases - 20 mL - clear  
unpreserved glass  
All vials filled w/o headspace

TOC - unpreserved  
1 L Nalgene

LPZ-5 not labeled (well)  
Sampled just after pump

Went fairly clear - now  
fairly dirty  
- amber

Sulfide container  
250 mL Nalgene  
Zn Acetate & NaOH

250 mL Amber glass  
 $H_2SO_4$  - metals: Fe, Mn  
(total)

Piezometer - 2 inch

Decon - depth device  
dip in alcohols  
dry and air-dry  
no rinsing

Sampling takes 45 minutes

OB-1 (labeled)  
Should be CBW-1

Checked Facility ORP -  
read ~ 223 mV 200 mV  
standard solution

only reused tubing is  
b/c Flow-through cell (FTC)  
and discard

Tubing can only ~~get~~ get down  
to 55 ft. b/c of pipes  
out of alignment  
Screened interval ~ 70.5 - 80.5

purge water discarded into  
drums, once full  
will get picked up by  
a contractor (changes)  
- drums are on site

will purge 2 volumes of F.T.C.  
mostly clear  
has previously had free product  
- haven't noticed this  
event

1/8 in. polyethylene tubing  
Flow rate 120 mL/min

1335

10.82  
23.2°C  
1765  $\mu$ S  
8 mV  
48.7  
4.04  
3.44 NTU

16.53 depth  
10.21 pH  
21.94°C  
1.989 mS/cm  
-28.2 mV  
65.3 % DO  
5.66 mg/L DO

1340

11.06  
22.8°C  
1770  $\mu$ S  
-21 mV  
46.06 %  
4.08 mg/L  
1.81 NTU

1345

11.10  
22.8°C pH  
1786  $\mu$ S  
-27 mV  
47.5 %  
4.20 mg/L  
0.94 NTU

1350

0.76 NTU  
4.13  
22.8°C  
1754  $\mu$ S  
-18 mV  
49.4 %  
4.49 mg/L

16.73 depth  
10.47  
22.01°C  
1.954 mS  
-32.7 mV  
63.4 % DO  
5.51 mg/L

16.89 dep  
10.61  
21.8°C  
1.964 mS  
-31.5 mV  
60.9 % DO  
5.32 mg/L DO

17.04 depth  
10.59  
21.76°C  
1.969 mS  
-21.2 mV  
63.1 %  
5.46 DO mg/L

1355 2.08 NTU  
 11.10  
 22.7 °C PH  
 1782  $\mu$ S  
 -20 mV  
 48.4  
 4.21

1717 depth  
 10.62  
 21.76 °C  
 1.971 mS  
 -19.7 mV  
 57.5 %  
 501 mg/L

Sample 1106738  
 1412

Clear

Sampling occurred between  
 1400-1450

Oil/water interface probe - same as  
 depth gauge

Low yield wells - still sampleable  
 via - low flow methods

Determines % recovery afterwards  
 using math

Custody seal cooler for  
 transport

did get rinse water for  
 non-dedicated equip.  
 at lunch

REC-4

Total depth 67  
 at 55 foot, placed in middle  
 of screened interval  
 depth to water 12.42  
 Flow rate 225 ml/min

1525

2.08 NTU  
 6.76

23.4 °C

-12 mV

2.36 mS

17.3 %

1.48 mg/L DO

1513 46 ft

6.55

21.27

2.564 mS

-69.0 mV

54.2 %

4.88 mg/L

Clear, slight smell

1528

6.77 pH  
 22.9 °C  
 2.29 mS  
 -36 mV  
 18.4 %  
 1.59 mg/L  
 7.67 NTU

1531

6.77  
 22.2 °C  
 2.36 mS/cm  
 -40 mV  
 14.0 %  
 1.21 mg/L

1532

12.46 ft  
 6.40 pH  
 21.64 °C  
 2.600 mS  
 -58.1 mV  
 43.6 %  
 3.80 mg/L

12.46 ft  
 6.36 pH  
 21.27 °C  
 2.591 mS  
 -54.4 mV  
 37.6 %  
 3.30 mg/L

12.46 ft  
 6.36 pH  
 21.38 °C  
 2.591 mS  
 -54.8 mV  
 35.4 %  
 3.09 mg/L

1535

1540  
(DNE)

11.3 NTU  
 2.35 mS  
 20.9 °C  
 1.19 mg/L  
 14.0 %  
 -47 mV  
 6.76 pH

6.35

12.46 ft

21.46 °C

2.596 mS/cm

-53.2 mV

30.5 %

2.67 mg/L

Sample 1540

1106739

&amp; Duplicate

1106740

light yellow to clear

65-75 °F

Very windy, extremely gusty

Previously monitored for VOCs  
 when doing total depth  
 measurements  
 also do breathing zone

MW-24B

Set at 41 feet  
 screened interval  
 26.70 depth to water  
 170 ml/min

Dup every 10  
 matrix spike every 20

1656

26.84 ft  
 6.81 pH  
 26.55 °C  
 2.786 mS  
 -89.9 mV  
 20.9 % DO  
 1.67 mg/L

1700

37.5 NTU  
 6.99 pH  
 26.3 °C  
 2.16 mS  
 -120 mV  
 23.7 % DO  
 1.96 mg/L

27.10 ft  
 6.75  
 24.87 °C  
 2.556 mS  
 -109.2 mV  
 14.7 %  
 1.21 mg/L

1703 34.9 NTU  
 7.02  
 2.10 mS  
 24.2 °C  
 -138  
 16.8%  
 1.50

#61706 31.3 NTU

7.01 pH  
 23.6 °C  
 2.02 mS/cm  
 -149 mV  
 15.1 %  
 1.31 mg/L

1709

27.11 depth  
 6.64 pH  
 24.19 °C  
 2.453 mS  
 -117.1 mV  
 12.4 %  
 1.03 mg/L

27.14 ft  
 6.59 pH  
 24.08 °C  
 2.424 mS  
 -118.6 mV  
 11.2 %  
 0.95 mg/L

27.18 ft  
 6.55  
 23.69 °C  
 2.392 mS  
 -119.8 mV  
 11.2 %  
 0.95 mg/L

clear w/ black particles

1712	22.4 NTU	27.22 ft
	7.03	6.53
	23.3 °C	23.52 °C
	2.10 mS	2.383 mS
	-149 mV	-121.8 mV
	15.9 % DO	10.9 %
	1.41 mg/L	0.92 mg/L

1715	19.3 NTU	27.22 ft
	7.00 pH	6.53
	23.0 °C	23.54 °C
	2.00 mS	2.379 mS
	-144 mV	-123.6 mV
	12.7 %	10.3 %
	1.16 mg/L	0.86 mg/L

Sample  
# 1725 ch  
# 1106756

MM-24 A

Previously had product  
none indicated w/ interface  
probe (LNIPL)

21.35 ft depth to 420  
Setting at 26 ± feet  
Screened interval at 28 (-)  
feet / partially out of water

Very bad odor  
Solvent ish / almost sweet  
150 mL / min

1813  
7.01 pH  
21.0 °C  
1493 mS  
-140 mV  
22.0 %  
1.62 mg/L  
19.3 NTU

1822 13 ft  
6.71 pH  
20.81 °C  
1.633 mS  
-110.3 mV  
14.2 %  
1.26 mg/L

1818 10.5 NTU  
6.92 pH  
20.6 °C  
1452  $\mu$ S/cm  
-142 mV  
19.8 % DO  
1.80 mg/L

~~1821~~ 9.5 NTU  
20.5 °C  
1478  $\mu$ S  
-141 mV  
19.5 % DO  
1.91 mg/L DO

1823



21.82 ft  
6.41  
20.45 °C  
1.614 mS/cm  
-98.8 mV  
11.4 %  
1.01 mg/L

21.91 ft.  
6.31 pH  
20.25 °C  
1.599 mS  
-99.3 mV  
9.3 %  
0.84 mg/L

1828 9.3 NTU  
-139 mV  
6.89 pH  
12.7 %  
1.09 mg/L  
1453  $\mu$ S  
21.1 °C

22.09 depth to H<sub>2</sub>O  
21.90 depth to NAPL

began sampling n/c  
LNAPL now present and  
need enough H<sub>2</sub>O to fill  
all containers

Sampling 1836 to 1905  
Sample 1840  
tag # 1106757  
very pale yellow

20.07 °C  
1.591 mS/cm  
6.29 pH  
-101.6 mV  
8.9 % DO  
0.80 mg/L

**Appendix C:**  
**Chain of Custody**  
**RCRA O&M Report**  
**Environmental Operations, Inc**  
**September 6, 2011**



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD



Tape sealed and initialed

Shipped

x Hand Delivered

Description of Delivery

Total No. Of Containers:

Carrier:

By:

Collector's Name: Pam Hackler

(Please Print)

Affiliation: KCRO NERO SERO SLRO SWRO WPP DGLS HWP ESP MoDOT

(circle one) MDC DHSS Other:

LAB USE ONLY!

Laboratory ID:

Location:

110907002

C-3

Sample Number	Sample Collected	Analyses Requested	Disinfect. Type	Field Parameters (include units)	Matrix (circle one)	Container Type	Preservative Type	Number of Containers
1106737 (Sample A) For Lab Use Only AB59329	Date: 9/6/2011 Time: 1147	VOA (SW 846: 8260) TDS (EPA 160.1) ALK (EPA 310.2) Nitrate (N) (EPA 353.2) Sulfate (EPA 375.2) Sulfide (EPA 376.2) Contract Lab Chloride (SM 4500-Cl-E) TOC (SM 5310-B) Methane/Ethane/Ethene/CO2 (Contract Lab)	(circle one) None Cl <sub>2</sub> UV Ozone Other:	D.O. 0.83 mg/L Flow pH 8.39 Cond. 3.65 mS/cm Temp. 21.6 °C Other: ORP -46 mV Turbidity 12.9 NTU	(circle one) Water Soil Organic Sludge Other:	1L CN 250 CN 250 CN 40ml AG 40ml AG CG 40ml AG 40ml AG CG HCL	4L NaOH 4L H <sub>3</sub> PO <sub>4</sub> HCL 4L CG HCL	1 1 1 2 2 2 3 2 3
1106738 (Sample B) For Lab Use Only AB59330	Date: 9/6/2011 Time: 1412	VOA (SW 846: 8260) TDS (EPA 160.1) ALK (EPA 310.2) Nitrate (N) (EPA 353.2) Sulfate (EPA 375.2) Sulfide (EPA 376.2) Contract Lab Chloride (SM 4500-Cl-E) TOC (SM 5310-B) Methane/Ethane/Ethene/CO2 (Contract Lab)	(circle one) None Cl <sub>2</sub> UV Ozone Other:	D.O. 4.21 mg/L Flow pH 11.10 Cond. 1782 uS/cm Temp. 22.7 °C Other: ORP -20 mV Turbidity 2.08 NTU	(circle one) Water Soil Organic Sludge Other:	1L CN 250 CN 250 CN 40ml AG 40ml AG CG 40ml AG 40ml AG CG HCL	4L NaOH 4L H <sub>3</sub> PO <sub>4</sub> HCL 4L CG HCL	1 2 1 2 2 2 3 2 3
1106739 (Sample C) For Lab Use Only AB59331	Date: 9/6/2011 Time: 1540	VOA (SW 846: 8260) TDS (EPA 160.1) ALK (EPA 310.2) Nitrate (N) (EPA 353.2) Sulfate (EPA 375.2) Sulfide (EPA 376.2) Contract Lab Chloride (SM 4500-Cl-E) TOC (SM 5310-B) Methane/Ethane/Ethene/CO2 (Contract Lab)	(circle one) None Cl <sub>2</sub> UV Ozone Other:	D.O. 1.19 mg/L Flow pH 6.76 Cond. 2.35 mS/cm Temp. 20.9 °C Other: ORP -47 mV Turbidity 11.3 NTU	(circle one) Water Soil Organic Sludge Other:	1L CN 250 CN 250 CN 40ml AG 40ml AG CG 40ml AG 40ml AG CG HCL	4L NaOH 4L H <sub>3</sub> PO <sub>4</sub> HCL 4L CG HCL	1 1 1 2 2 2 3 2 3
1106740 (Sample D) For Lab Use Only AB59332	Date: 9/6/2011 Time: N/A	VOA (SW 846: 8260) TDS (EPA 160.1) ALK (EPA 310.2) Nitrate (N) (EPA 353.2) Sulfate (EPA 375.2) Sulfide (EPA 376.2) Contract Lab Chloride (SM 4500-Cl-E) TOC (SM 5310-B) Methane/Ethane/Ethene/CO2 (Contract Lab)	(circle one) None Cl <sub>2</sub> UV Ozone Other:	D.O. Flow pH Cond. Temp. Other: ORP Turbidity	(circle one) Water Soil Organic Sludge Other:	1L CN 250 CN 250 CN 40ml AG 40ml AG CG 40ml AG 40ml AG CG HCL	4L NaOH 4L H <sub>3</sub> PO <sub>4</sub> HCL 4L CG HCL	1 1 1 2 2 2 3 2 3

Relinquished By: Pam Hackler

Received By: A. P. A.

Date: 9-7-11 CG Time: 1014

Relinquished By:

Received By:

Date: Time:

Relinquished By:

Received By:

Date: Time:



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD



<b>Sample A</b>		<b>LDPR:</b>	FEROM	<b>Job Code:</b>	NJ00SOLU	<b>Sample Reference ID:</b>			
<b>Facility ID:</b>		MOD004954111		<b>Site/Study Name:</b>		Environmental Operations Inc. Former Solutia-Queeny Plant			
<b>County:</b>		St. Louis City		<b>Sample Event Type: (circle one)</b>		<b>Sample Type: (circle one)</b>			
<b>Sample Comment (where and how the sample was collected):</b> LPZ-5, low-flow peristaltic purge & sample, odor, 2 inch piezometer, light amber, flushmount				Grab		Composite	Modified	Other:	
				Bypass/SSO		Air		Soil	
				Complaint		Container		Spill	
				Emergency Response		Discharge		Storm Water	
				Inspection		Groundwater		Surface Water	
<b>GPS Coordinates</b> (UTM Zone 15 NAD83 Only)		<b>X Easting</b>	<b>Y Northing</b>	<b>Accuracy</b>	(circle one)	<b>EPE (meters)</b> PDOP	Investigation	Organic	Wipes
							Monitoring	Sediment	
							Special Project	Sludge	
								Drinking Water Supply	

<b>Sample B</b>		<b>LDPR:</b>	FEROM	<b>Job Code:</b>	NJ00SOLU	<b>Sample Reference ID:</b>			
<b>Facility ID:</b>		MOD004954111		<b>Site/Study Name:</b>		Environmental Operations Inc. Former Solutia-Queeny Plant			
<b>County:</b>		St. Louis City		<b>Sample Event Type: (circle one)</b>		<b>Sample Type: (circle one)</b>			
<b>Sample Comment (where and how the sample was collected):</b> OBW-1, low-flow peristaltic purge & sample, clear				Grab		Composite	Modified	Other:	
				Bypass/SSO		Air		Soil	
				Complaint		Container		Spill	
				Emergency Response		Discharge		Storm Water	
				Inspection		Groundwater		Surface Water	
<b>GPS Coordinates</b> (UTM Zone 15 NAD83 Only)		<b>X Easting</b>	<b>Y Northing</b>	<b>Accuracy</b>	(circle one)	<b>EPE (meters)</b> PDOP	Investigation	Organic	Wipes
							Monitoring	Sediment	
							Special Project	Sludge	
								Drinking Water Supply	

<b>Sample C</b>		<b>LDPR:</b>	FEROM	<b>Job Code:</b>	NJ00SOLU	<b>Sample Reference ID:</b>			
<b>Facility ID:</b>		MOD004954111		<b>Site/Study Name:</b>		Environmental Operations Inc. Former Solutia-Queeny Plant			
<b>County:</b>		St. Louis City		<b>Sample Event Type: (circle one)</b>		<b>Sample Type: (circle one)</b>			
<b>Sample Comment (where and how the sample was collected):</b> REC-4, low-flow peristaltic purge & sample, 4-inch well under manhole cover, light yellow to clear				Grab		Composite	Modified	Other:	
				Bypass/SSO		Air		Soil	
				Complaint		Container		Spill	
				Emergency Response		Discharge		Storm Water	
				Inspection		Groundwater		Surface Water	
<b>GPS Coordinates</b> (UTM Zone 15 NAD83 Only)		<b>X Easting</b>	<b>Y Northing</b>	<b>Accuracy</b>	(circle one)	<b>EPE (meters)</b> PDOP	Investigation	Organic	Wipes
							Monitoring	Sediment	
							Special Project	Sludge	
								Drinking Water Supply	

<b>Sample D</b>		<b>LDPR:</b>	FEROM	<b>Job Code:</b>	NJ00SOLU	<b>Sample Reference ID:</b>			
<b>Facility ID:</b>		MOD004954111		<b>Site/Study Name:</b>		Environmental Operations Inc. Former Solutia-Queeny Plant			
<b>County:</b>		St. Louis City		<b>Sample Event Type: (circle one)</b>		<b>Sample Type: (circle one)</b>			
<b>Sample Comment (where and how the sample was collected):</b> Duplicate				Grab		Composite	Modified	Other:	
				Bypass/SSO		Air		Soil	
				Complaint		Container		Spill	
				Emergency Response		Discharge		Storm Water	
				Inspection		Groundwater		Surface Water	
<b>GPS Coordinates</b> (UTM Zone 15 NAD83 Only)		<b>X Easting</b>	<b>Y Northing</b>	<b>Accuracy</b>	(circle one)	<b>EPE (meters)</b> PDOP	Investigation	Organic	Wipes
							Monitoring	Sediment	
							Special Project	Sludge	
								Drinking Water Supply	

Remarks:

Temp 4.4°C

Sample #s 1106737-1106740

Page 1 of 2



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD



Tape sealed and initialed		Description of Delivery	
Shipped		Total No. Of Containers: _____	
x Hand Delivered		Carrier: _____	
		By: _____	

Collector's Name: Pam Hackler

(Please Print)

Affiliation: KCRO NERO SERO SLRO SWRO WPP DGLS HWP ESP MoDOT  
(circle one) MDC DHSS Other:

Sample Number	Sample Collected	Analyses Requested	Disinfect. Type	Field Parameters (include units)	Matrix (circle one)	Container Type	Preservative Type	Number of Containers
1106756 (Sample A)	Date: 9/6/2011	VOA (SW 846: 8260) TDS (EPA 160.1) ALK (EPA 310.2) Nitrate (N) (EPA 353.2) Sulfate (EPA 375.2)	(circle one) None	D.O. 1.16 mg/L Flow pH 7.00 Cond. 2.00 mS/cm Temp. 23.0°C Other: ORP -144 mV Turbidity 19.3 NTU	(circle one) Water	1L CN 250 CN 250 CN 40ml AG	4L NaOH 4L HCl	1 1 1 3
For Lab Use Only AB59333	Time: 1725	Sulfide (EPA 376.2) Contract Lab Chloride (SM 4500-Cl-E) TOC (SM 5310-B) Methane/Ethane/Ethene/CO2 (Contract Lab)	Cl2 UV Ozone Other:		Soil Organic Sludge Other:	40ml AG 40ml AG 40ml AG 40ml AG	4L 4L H2PO4 HCl	3 3 2 2
1106757 (Sample B)	Date: 9/6/2011	VOA (SW 846: 8260) TDS (EPA 160.1) ALK (EPA 310.2) Nitrate (N) (EPA 353.2) Sulfate (EPA 375.2)	(circle one) None	D.O. 1.09 mg/L Flow pH 6.89 Cond. 1453 µS/cm Temp. 21.1°C Other: ORP -139 mV Turbidity 9.3 NTU	(circle one) Water	1L CN 250 CN 250 CN 40ml AG	4L NaOH 4L HCl	1 1 1 3
For Lab Use Only AB59334	Time: 1840	Sulfide (EPA 376.2) Contract Lab Chloride (SM 4500-Cl-E) TOC (SM 5310-B) Methane/Ethane/Ethene/CO2 (Contract Lab)	Cl2 UV Ozone Other:		Soil Organic Sludge Other:	40ml AG 40ml AG 40ml AG 40ml AG	4L 4L H2PO4 HCl	3 3 2 2
1106736 (Sample C)	Date: 9/6/2011	VOA (SW 846: 8260) <del>TDS (EPA 160.1) ALK (EPA 310.2)</del> <del>Nitrate (N) (EPA 353.2)</del> <del>Sulfate (EPA 375.2)</del>	(circle one) None	D.O. Flow pH Cond. Temp. Other: ORP Turbidity	(circle one) Water	1L CN 250 CN 250 CN 40ml AG	4L <del>NaOH</del> 4L HCl	1 1 1 3
For Lab Use Only AB59335	Time: N/A	Sulfide (EPA 376.2) Contract Lab Chloride (SM 4500-Cl-E) TOC (SM 5310-B) Methane/Ethane/Ethene/CO2 (Contract Lab)	Cl2 UV Ozone Other:		Soil Organic Sludge Other:	40ml AG 40ml AG 40ml AG 40ml AG	4L 4L H2PO4 HCl	3 3 2 2
(Sample D)	Date: 9/6/2011	VOA (SW 846: 8260) TDS (EPA 160.1) ALK (EPA 310.2) Nitrate (N) (EPA 353.2) Sulfate (EPA 375.2)	(circle one) None	D.O. Flow pH Cond. Temp. Other: ORP Turbidity	Water Soil Organic Sludge Other:			
For Lab Use Only	Time:	Sulfide (EPA 376.2) Contract Lab Chloride (SM 4500-Cl-E) TOC (SM 5310-B) Methane/Ethane/Ethene/CO2 (Contract Lab)	Cl2 UV Ozone Other:					

Relinquished By: <i>[Signature]</i>	Received By: <i>[Signature]</i>	Date: 9-7-11	Time: 1016
Relinquished By:	Received By:	Date:	Time:
Relinquished By:	Received By:	Date:	Time:



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
FIELD SHEET AND CHAIN-OF-CUSTODY RECORD



<b>Sample A</b>		<b>LDPR:</b>	<b>FEROM</b>	<b>Job Code:</b>	<b>NJ00SOLU</b>	<b>Sample Reference ID:</b>	
<b>Facility ID:</b>		<b>Site/Study Name:</b>		<b>County:</b>		<b>Sample Event Type: (circle one)</b>	
MOD004954111		Environmental Operations Inc. Former Solutia-Queeny Plant		St. Louis City		Bypass/SSO Complaint Emergency Response <b>Inspection</b> Investigation Monitoring Special Project	
<b>Sample Comment (where and how the sample was collected):</b>						<b>Sample Type: (circle one)</b>	
MW-24 B, low-flow peristaltic, clear with black-fine particles						Air Container Discharge <b>Groundwater</b> Organic Sediment Sludge Drinking Water Supply	
<b>GPS Coordinates</b>		<b>X Easting</b>	<b>Y Northing</b>	<b>Accuracy</b>		<b>EPE (meters)</b>	
(UTM Zone 15 NAD83 Only)				(circle one)		PDOP	

<b>Sample B</b>		<b>LDPR:</b>	<b>FEROM</b>	<b>Job Code:</b>	<b>NJ00SOLU</b>	<b>Sample Reference ID:</b>	
<b>Facility ID:</b>		<b>Site/Study Name:</b>		<b>County:</b>		<b>Sample Event Type: (circle one)</b>	
MOD004954111		Environmental Operations Inc. Former Solutia-Queeny Plant		St. Louis City		Bypass/SSO Complaint Emergency Response <b>Inspection</b> Investigation Monitoring Special Project	
<b>Sample Comment (where and how the sample was collected):</b>						<b>Sample Type: (circle one)</b>	
MW-24 A, very strong odor, LNAPL present, pale yellow, low-flow peristaltic purge and sample						Air Container Discharge <b>Groundwater</b> Organic Sediment Sludge Drinking Water Supply	
<b>GPS Coordinates</b>		<b>X Easting</b>	<b>Y Northing</b>	<b>Accuracy</b>		<b>EPE (meters)</b>	
(UTM Zone 15 NAD83 Only)				(circle one)		PDOP	

<b>Sample C</b>		<b>LDPR:</b>	<b>FEROM</b>	<b>Job Code:</b>	<b>NJ00SOLU</b>	<b>Sample Reference ID:</b>	
<b>Facility ID:</b>		<b>Site/Study Name:</b>		<b>County:</b>		<b>Sample Event Type: (circle one)</b>	
MOD004954111		Environmental Operations Inc. Former Solutia-Queeny Plant		St. Louis City		Bypass/SSO Complaint Emergency Response <b>Inspection</b> Investigation Monitoring Special Project	
<b>Sample Comment (where and how the sample was collected):</b>						<b>Sample Type: (circle one)</b>	
Trip Blank						Air Container Discharge <b>Groundwater</b> Organic Sediment Sludge Drinking Water Supply	
<b>GPS Coordinates</b>		<b>X Easting</b>	<b>Y Northing</b>	<b>Accuracy</b>		<b>EPE (meters)</b>	
(UTM Zone 15 NAD83 Only)				(circle one)		PDOP	

<b>Sample D</b>		<b>LDPR:</b>	<b>FEROM</b>	<b>Job Code:</b>	<b>NJ00SOLU</b>	<b>Sample Reference ID:</b>	
<b>Facility ID:</b>		<b>Site/Study Name:</b>		<b>County:</b>		<b>Sample Event Type: (circle one)</b>	
MOD004954111		Environmental Operations Inc. Former Solutia-Queeny Plant		St. Louis City		Bypass/SSO Complaint Emergency Response <b>Inspection</b> Investigation Monitoring Special Project	
<b>Sample Comment (where and how the sample was collected):</b>						<b>Sample Type: (circle one)</b>	
						Air Container Discharge <b>Groundwater</b> Organic Sediment Sludge Drinking Water Supply	
<b>GPS Coordinates</b>		<b>X Easting</b>	<b>Y Northing</b>	<b>Accuracy</b>		<b>EPE (meters)</b>	
(UTM Zone 15 NAD83 Only)				(circle one)		PDOP	

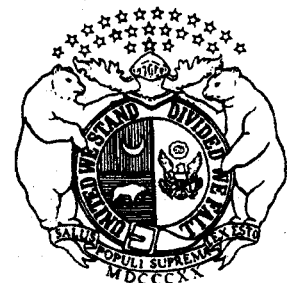
Remarks:

Sample #s 1106756-1106757, trip blank # 1106736

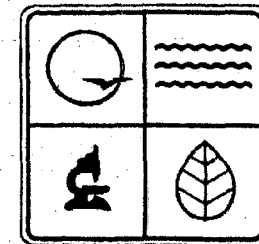
Temp 4.4°C

Page 2 of 2

**Appendix D:**  
**Analytical Results**  
**RCRA O&M Report**  
**Environmental Operations, Inc**  
**September 6, 2011**



Missouri Department of Natural Resources  
Environmental Services Program



Order ID 110907002

Program, Contact: HWP Bill Fanska

Report Date: 10/17/2011

LDPR/JobCode: FEROM / NJ00SOLU



Sample: AB59329

Facility ID: MOD004954111

Site: Environmental Operations Inc.

County: St. Louis City

Sample Reference ID:

Collector: PAM HACKLER

Affiliation: ESP

Collect Date: 9/6/2011 11:47:00AM

Entry Point:

Sample Comment: LPZ-5, low-flow peristaltic purge & sample, odor, 2 inch piezometer, light amber, flushmount, grab.



Customer #: 1106737

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Carbon Dioxide	Carbon Dioxide	5740		ug/L		Contract Lab Dep
Chloride	Chloride	271		mg/L	12,425	SM 4500-Cl-E
Ethane	Ethane	71.4		ug/L		Contract Lab Dep
Ethene	Ethene	264		ug/L		Contract Lab Dep
Field Dissolved Oxygen	Field Dissolved Oxygen	0.83		mg/L		SM 4500-O-G
Field pH	Field pH	8.39		pH Units		EPA 150.1
Field Specific Conductivity	Field Specific Conductivity	3.65 mS/cm				SM 2510
Field Temperature	Field Temperature	21.6 C				EPA 170.1
Field Turbidity	Field Turbidity	12.9		NTU		EPA 180.1
Methane	Methane	8860	09	ug/L		Contract Lab Dep
Nitrate as N	Nitrate as N	0.071		mg/L	12,395	EPA 353.2
Oxidation Reduction Potential-Dissolved	Oxidation Reduction Potential-Dissolved	-46		mV		Not Applicable
Sulfate	Sulfate	29.6	11	mg/L	12,442	EPA 375.2
Sulfide	Sulfide	190	03, 04	mg/L	12,708	Contract Lab Dep
Total Alkalinity as CaCO3	Total Alkalinity as CaCO3	1320		mg/L	12,429	SM 2320 B
Total Dissolved Solids	Total Dissolved Solids	2590		mg/L	12,483	EPA 160.1
Total Organic Carbon	Total Organic Carbon	543	09	mg/L	12,794	SM 5310-C
VOAs	1,1,1,2-Tetrachloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1,1-Trichloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1,2,2-Tetrachloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1,2-Trichloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1-Dichloroethane	787	09	ug/L	12,397	8260B
VOAs	1,1-Dichloroethene	62.9	09, 05	ug/L	12,397	8260B
VOAs	1,1-Dichloropropanone	<100	09, ND	ug/L	12,397	8260B
VOAs	1,1-Dichloropropene	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,2,3-Trichlorobenzene	<250	09, ND	ug/L	12,397	8260B

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Site: Environmental Operations Inc.

Sample Reference ID:

Affiliation: ESP

Collect Date: 9/6/2011 11:47:00AM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	1,2,3-Trichloropropane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,2,4-Trichlorobenzene	<250	09, ND	µg/L	12,397	8260B
VOAs	1,2,4-Trimethylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dibromo-3-chloropropane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dibromoethane (EDB)	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichlorobenzene	142	09	µg/L	12,397	8260B
VOAs	1,2-Dichloroethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichloropropane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,3,5-Trimethylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,3-Dichlorobenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,3-Dichloropropane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1,4-Dichlorobenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	1-Chlorobutane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	2,2-Dichloropropane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	2-Butanone (MEK)	<250	09, ND	µg/L	12,397	8260B
VOAs	2-Chlorotoluene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	2-Hexanone	<100	09, ND	µg/L	12,397	8260B
VOAs	2-Nitropropane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	4-Chlorotoluene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	4-Methyl-2-pentanone(MIBK)	<50.0	09, ND	µg/L	12,397	8260B
VOAs	acetone	<1000	09, ND	µg/L	12,397	8260B
VOAs	Acrylonitrile	<100	09, ND	µg/L	12,397	8260B
VOAs	Allyl Chloride	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Benzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromobenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromochloromethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromodichloromethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromoform	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromomethane	<250	09, ND	µg/L	12,397	8260B
VOAs	carbon disulfide	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Carbon Tetrachloride	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Chloroacetonitrile	<1250	09, ND	µg/L	12,397	8260B
VOAs	Chlorobenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Chloroethane	<250	09, ND	µg/L	12,397	8260B
VOAs	Chloroform	<50.0	09, ND	µg/L	12,397	8260B

Sample: AB59329



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County: St. Louis City

Site: Environmental Operations Inc.

Sample Reference ID:

Collector: PAM HACKLER

Affiliation: ESP

Collect Date: 9/6/2011 11:47:00AM

Entry Point:

Sample Comment: LPZ-5, low-flow peristaltic purge &amp; sample, odor, 2 inch piezometer, light amber, flushmount, grab.

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Chloromethane	<1250	09, ND	µg/L	12,397	8260B
VOAs	cis-1,2-dichloroethene	32700	09	µg/L	12,397	8260B
VOAs	cis-1,3-Dichloropropene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Dibromochloromethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Dibromomethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Dichlorodifluoromethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Diethyl ether	<1000	09, ND	µg/L	12,397	8260B
VOAs	Ethylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Ethylmethacrylate	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Hexachlorobutadiene	<100	09, ND	µg/L	12,397	8260B
VOAs	Hexachloroethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Iodomethane	<250	09, ND	µg/L	12,397	8260B
VOAs	Isopropylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	m&p-Xylenes	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Methacrylonitrile	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Methyl Acrylate	<500	09, ND	µg/L	12,397	8260B
VOAs	Methylene chloride	<1000	09, ND	µg/L	12,397	8260B
VOAs	Methylmethacrylate	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Methyl-t-butyl ether	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Naphthalene	<250	09, ND	µg/L	12,397	8260B
VOAs	n-Butylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Nitrobenzene	<500	09, ND	µg/L	12,397	8260B
VOAs	n-Propylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	o-Xylene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Pentachloroethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	p-isopropyltoluene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Propionitrile	<1000	09, ND	µg/L	12,397	8260B
VOAs	sec-Butylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Styrene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	tert-Butylbenzene	<100	09, ND	µg/L	12,397	8260B
VOAs	Tetrachloroethene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Tetrahydrofuran	<250	09, ND	µg/L	12,397	8260B
VOAs	Toluene	197000	09	µg/L	12,397	8260B
VOAs	Total Xylenes	<100	09, ND	µg/L	12,397	8260B
VOAs	trans-1,2-Dichloroethene	149	09	µg/L	12,397	8260B

**Sample: AB59329****Customer #: 1106737****Facility ID:** MOD004954111**County:** St. Louis City**Collector:** PAM HACKLER**Entry Point:****Sample Comment:** LPZ-5, low-flow peristaltic purge & sample, odor, 2 inch piezometer, light amber, flushmount, grab.**Site:** Environmental Operations Inc.**Sample Reference ID:****Affiliation:** ESP**Collect Date:** 9/6/2011 11:47:00AM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	trans-1,3-Dichloropropene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	trans-1,4-Dichloro-2-butene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Trichloroethene	2020	09	µg/L	12,397	8260B
VOAs	Trichlorofluoromethane	<250	09, ND	µg/L	12,397	8260B
VOAs	Vinyl Chloride	7730	06, 09	µg/L	12,397	8260B

**Sample: AB59330****Customer #: 1106738****Facility ID:** MOD004954111**County:** St. Louis City**Collector:** PAM HACKLER**Entry Point:****Sample Comment:** OBW-1, low-flow peristaltic purge & sample, clear, grab.**Site:** Environmental Operations Inc.**Sample Reference ID:****Affiliation:** ESP**Collect Date:** 9/6/2011 2:12:00PM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Carbon Dioxide	Carbon Dioxide	<500	ND	µg/L		Contract Lab Dep
Chloride	Chloride	337		mg/L	12,425	SM 4500-Cl-E
Ethane	Ethane	32.2		µg/L		Contract Lab Dep
Ethene	Ethene	78.1		µg/L		Contract Lab Dep
Field Dissolved Oxygen	Field Dissolved Oxygen	4.21		mg/L		SM 4500-O-G
Field pH	Field pH	11.10		pH Units		EPA 150.1
Field Specific Conductivity	Field Specific Conductivity	1782 µS/cm				SM 2510
Field Temperature	Field Temperature	22.7 C				EPA 170.1
Field Turbidity	Field Turbidity	2.08		NTU		EPA 180.1
Methane	Methane	1050	09	µg/L		Contract Lab Dep
Nitrate as N	Nitrate as N	0.011	05	mg/L	12,395	EPA 353.2
Oxidation Reduction Potential-Dissolved	Oxidation Reduction Potential-Dissolved	-20		mV		Not Applicable
Sulfate	Sulfate	129		mg/L	12,442	EPA 375.2
Sulfide	Sulfide	<2.0	03, ND, 04	mg/L	12,708	Contract Lab Dep
Total Alkalinity as CaCO3	Total Alkalinity as CaCO3	72.0		mg/L	12,429	SM 2320 B
Total Dissolved Solids	Total Dissolved Solids	921		mg/L	12,483	EPA 160.1
Total Organic Carbon	Total Organic Carbon	14.0		mg/L	12,794	SM 5310-C
VOAs	1,1,1,2-Tetrachloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,1,1-Trichloroethane	0.52	05	µg/L	12,397	8260B
VOAs	1,1,2,2-Tetrachloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,1,2-Trichloroethane	<0.5	ND	µg/L	12,397	8260B

**Sample: AB59330****Customer #: 1106738****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** OBW-1, low-flow peristaltic purge & sample, clear, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 2:12:00PM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	1,1-Dichloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethene	13.7		µg/L	12,397	8260B
VOAs	1,1-Dichloropropanone	<1	ND	µg/L	12,397	8260B
VOAs	1,1-Dichloropropene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichlorobenzene	<2.5	ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2,4-Trichlorobenzene	<2.5	ND	µg/L	12,397	8260B
VOAs	1,2,4-Trimethylbenzene	0.52	05	µg/L	12,397	8260B
VOAs	1,2-Dibromo-3-chloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2-Dibromoethane (EDB)	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2-Dichlorobenzene	118		µg/L	12,397	8260B
VOAs	1,2-Dichloroethane	11.0		µg/L	12,397	8260B
VOAs	1,2-Dichloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,3,5-Trimethylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,3-Dichlorobenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,3-Dichloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,4-Dichlorobenzene	9.86		µg/L	12,397	8260B
VOAs	1-Chlorobutane	7.48		µg/L	12,397	8260B
VOAs	2,2-Dichloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	2-Butanone (MEK)	<2.5	ND	µg/L	12,397	8260B
VOAs	2-Chlorotoluene	1.20		µg/L	12,397	8260B
VOAs	2-Hexanone	<1	ND	µg/L	12,397	8260B
VOAs	2-Nitropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	4-Chlorotoluene	0.92	05	µg/L	12,397	8260B
VOAs	4-Methyl-2-pentanone(MIBK)	<0.5	ND	µg/L	12,397	8260B
VOAs	acetone	36.8		µg/L	12,397	8260B
VOAs	Acrylonitrile	<1	ND	µg/L	12,397	8260B
VOAs	Allyl Chloride	<0.5	ND	µg/L	12,397	8260B
VOAs	Benzene	34.0		µg/L	12,397	8260B
VOAs	Bromobenzene	0.82	05	µg/L	12,397	8260B
VOAs	Bromochloromethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Bromodichloromethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Bromoform	<0.5	ND	µg/L	12,397	8260B
VOAs	Bromomethane	<2.5	ND	µg/L	12,397	8260B
VOAs	carbon disulfide	<0.5	ND	µg/L	12,397	8260B

**Sample: AB59330****Customer #: 1106738****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** OBW-1, low-flow peristaltic purge & sample, clear, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 2:12:00PM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Carbon Tetrachloride	<0.5	ND	µg/L	12,397	8260B
VOAs	Chloroacetonitrile	<12.5	ND	µg/L	12,397	8260B
VOAs	Chlorobenzene	15300	09	µg/L	12,397	8260B
VOAs	Chloroethane	<2.5	ND	µg/L	12,397	8260B
VOAs	Chloroform	30.9		µg/L	12,397	8260B
VOAs	Chloromethane	<12.5	ND	µg/L	12,397	8260B
VOAs	cis-1,2-dichloroethene	18600	09	µg/L	12,397	8260B
VOAs	cis-1,3-Dichloropropene	<0.5	ND	µg/L	12,397	8260B
VOAs	Dibromochloromethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Dibromomethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Dichlorodifluoromethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Diethyl ether	<10	ND	µg/L	12,397	8260B
VOAs	Ethylbenzene	0.84	05	µg/L	12,397	8260B
VOAs	Ethylmethacrylate	<0.5	ND	µg/L	12,397	8260B
VOAs	Hexachlorobutadiene	<1	ND	µg/L	12,397	8260B
VOAs	Hexachloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Iodomethane	<2.5	ND	µg/L	12,397	8260B
VOAs	Isopropylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	m&p-Xylenes	1.07		µg/L	12,397	8260B
VOAs	Methacrylonitrile	<0.5	ND	µg/L	12,397	8260B
VOAs	Methyl Acrylate	<5	ND	µg/L	12,397	8260B
VOAs	Methylene chloride	<10	ND	µg/L	12,397	8260B
VOAs	Methylmethacrylate	<0.5	ND	µg/L	12,397	8260B
VOAs	Methyl-t-butyl ether	<0.5	ND	µg/L	12,397	8260B
VOAs	Naphthalene	<2.5	ND	µg/L	12,397	8260B
VOAs	n-Butylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	Nitrobenzene	7440	09	µg/L	12,397	8260B
VOAs	n-Propylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	o-Xylene	0.87	05	µg/L	12,397	8260B
VOAs	Pentachloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	p-isopropyltoluene	4.15		µg/L	12,397	8260B
VOAs	Propionitrile	<10	ND	µg/L	12,397	8260B
VOAs	sec-Butylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	Styrene	<0.5	ND	µg/L	12,397	8260B
VOAs	tert-Butylbenzene	<1	ND	µg/L	12,397	8260B

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Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Tetrachloroethene	192000	09	µg/L	12,397	8260B
VOAs	Tetrahydrofuran	<2.5	ND	µg/L	12,397	8260B
VOAs	Toluene	199		µg/L	12,397	8260B
VOAs	Total Xylenes	1.74	05	µg/L	12,397	8260B
VOAs	trans-1,2-Dichloroethene	185		µg/L	12,397	8260B
VOAs	trans-1,3-Dichloropropene	<0.5	ND	µg/L	12,397	8260B
VOAs	trans-1,4-Dichloro-2-butene	<0.5	ND	µg/L	12,397	8260B
VOAs	Trichloroethene	13300	09	µg/L	12,397	8260B
VOAs	Trichlorofluoromethane	<2.5	ND	µg/L	12,397	8260B
VOAs	Vinyl Chloride	2130	09	µg/L	12,397	8260B

**Sample: AB59331****Customer #: 1106739****Facility ID:** MOD004954111**County:** St. Louis City**Collector:** PAM HACKLER**Entry Point:****Sample Comment:** REC-4, low-flow peristaltic purge & sample, 4-inch well under manhole cover, light yellow to clear, grab.**Site:** Environmental Operations Inc.**Sample Reference ID:****Affiliation:** ESP**Collect Date:** 9/6/2011 3:40:00PM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Carbon Dioxide	Carbon Dioxide	176000	09	ug/L		Contract Lab Dep
Chloride	Chloride	353		mg/L	12,425	SM 4500-Cl-E
Ethane	Ethane	3.45		ug/L		Contract Lab Dep
Ethene	Ethene	12.3		ug/L		Contract Lab Dep
Field Dissolved Oxygen	Field Dissolved Oxygen	1.19		mg/L		SM 4500-O-G
Field pH	Field pH	6.76		pH Units		EPA 150.1
Field Specific Conductivity	Field Specific Conductivity	2.35 mS/cm				SM 2510
Field Temperature	Field Temperature	20.9 C				EPA 170.1
Field Turbidity	Field Turbidity	11.3		NTU		EPA 180.1
Methane	Methane	313		ug/L		Contract Lab Dep
Nitrate as N	Nitrate as N	<0.01	ND	mg/L	12,395	EPA 353.2
Oxidation Reduction Potential-Dissolved	Oxidation Reduction Potential-Dissolved	-47		mV		Not Applicable
Sulfate	Sulfate	238		mg/L	12,442	EPA 375.2
Sulfide	Sulfide	<2.0	03, ND, 04	mg/L	12,708	Contract Lab Dep
Total Alkalinity as CaCO3	Total Alkalinity as CaCO3	452		mg/L	12,429	SM 2320 B
Total Dissolved Solids	Total Dissolved Solids	1478		mg/L	12,483	EPA 160.1

Sample: AB59331



Customer #: 1106739

Facility ID: MOD004954111

County: St. Louis City

Collector: PAM HACKLER

Entry Point:

Sample Comment: REC-4, low-flow peristaltic purge &amp; sample, 4-inch well under manhole cover, light yellow to clear, grab.

Site: Environmental Operations Inc.

Sample Reference ID:

Affiliation: ESP

Collect Date: 9/6/2011 3:40:00PM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Total Organic Carbon	Total Organic Carbon	3.33		mg/L	12,794	SM 5310-C
VOAs	1,1,1,2-Tetrachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,1-Trichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,2,2-Tetrachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,2-Trichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethene	11.3	09	µg/L	12,397	8260B
VOAs	1,1-Dichloropropanone	<10.0	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichlorobenzene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2,4-Trichlorobenzene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	1,2,4-Trimethylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dibromo-3-chloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dibromoethane (EDB)	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichlorobenzene	5.19	09, 05	µg/L	12,397	8260B
VOAs	1,2-Dichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3,5-Trimethylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3-Dichlorobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,4-Dichlorobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1-Chlorobutane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2,2-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2-Butanone (MEK)	<25.0	09, ND	µg/L	12,397	8260B
VOAs	2-Chlorotoluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2-Hexanone	<10.0	09, ND	µg/L	12,397	8260B
VOAs	2-Nitropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	4-Chlorotoluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	4-Methyl-2-pentanone(MIBK)	<5.00	09, ND	µg/L	12,397	8260B
VOAs	acetone	<100	09, ND	µg/L	12,397	8260B
VOAs	Acrylonitrile	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Allyl Chloride	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Benzene	5.89	09, 05	µg/L	12,397	8260B
VOAs	Bromobenzene	<5.00	09, ND	µg/L	12,397	8260B

Sample: AB59331



Facility ID: MOD004954111

County: St. Louis City

Site: Environmental Operations Inc.

Sample Reference ID:

Collector: PAM HACKLER

Affiliation: ESP

Collect Date: 9/6/2011 3:40:00PM

Entry Point:

Sample Comment: REC-4, low-flow peristaltic purge &amp; sample, 4-inch well under manhole cover, light yellow to clear, grab

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Bromochloromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromodichloromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromoform	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromomethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	carbon disulfide	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Carbon Tetrachloride	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Chloroacetonitrile	<125	09, ND	µg/L	12,397	8260B
VOAs	Chlorobenzene	963	09	µg/L	12,397	8260B
VOAs	Chloroethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Chloroform	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Chloromethane	<125	09, ND	µg/L	12,397	8260B
VOAs	cis-1,2-dichloroethene	3370	09	µg/L	12,397	8260B
VOAs	cis-1,3-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dibromochloromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dibromomethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dichlorodifluoromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Diethyl ether	<100	09, ND	µg/L	12,397	8260B
VOAs	Ethylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Ethylmethacrylate	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Hexachlorobutadiene	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Hexachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Iodomethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Isopropylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	m&p-Xylenes	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Methacrylonitrile	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Methyl Acrylate	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Methylene chloride	<100	09, ND	µg/L	12,397	8260B
VOAs	Methylmethacrylate	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Methyl-t-butyl ether	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Naphthalene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	n-Butylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Nitrobenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	n-Propylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	o-Xylene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Pentachloroethane	<5.00	09, ND	µg/L	12,397	8260B

**Sample: AB59331****Customer #: 1106739****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** REC-4, low-flow peristaltic purge & sample, 4-inch well under manhole cover, light yellow to clear, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 3:40:00PM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	p-isopropyltoluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Propionitrile	<100	09, ND	µg/L	12,397	8260B
VOAs	sec-Butylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Styrene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	tert-Butylbenzene	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Tetrachloroethene	3510	09	µg/L	12,397	8260B
VOAs	Tetrahydrofuran	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Toluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Total Xylenes	<10.0	09, ND	µg/L	12,397	8260B
VOAs	trans-1,2-Dichloroethene	75.7	09	µg/L	12,397	8260B
VOAs	trans-1,3-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	trans-1,4-Dichloro-2-butene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Trichloroethene	14500	09	µg/L	12,397	8260B
VOAs	Trichlorofluoromethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Vinyl Chloride	256	06, 09	µg/L	12,397	8260B

**Sample: AB59332****Customer #: 1106740****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** Duplicate, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 12:00:00AM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Carbon Dioxide	Carbon Dioxide	176000	09	ug/L		Contract Lab Dep
Chloride	Chloride	354		mg/L	12,425	SM 4500-Cl-E
Ethane	Ethane	3.40		ug/L		Contract Lab Dep
Ethene	Ethene	12.1		ug/L		Contract Lab Dep
Methane	Methane	310		ug/L		Contract Lab Dep
Nitrate as N	Nitrate as N	<0.01	ND	mg/L	12,395	EPA 353.2
Sulfate	Sulfate	234		mg/L	12,442	EPA 375.2
Sulfide	Sulfide	<2.0	03, ND, 04	mg/L	12,708	Contract Lab Dep
Total Alkalinity as CaCO3	Total Alkalinity as CaCO3	448		mg/L	12,429	SM 2320 B
Total Dissolved Solids	Total Dissolved Solids	1487		mg/L	12,483	EPA 180.1
Total Organic Carbon	Total Organic Carbon	3.30		mg/L	12,794	SM 5310-C

Sample: AB59332



Facility ID: MOD004954111

County: St. Louis City

Site: Environmental Operations Inc.

Sample Reference ID:

Collector: PAM HACKLER

Affiliation: ESP

Collect Date: 9/6/2011 12:00:00AM

Entry Point:

Sample Comment: Duplicate, grab.

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	1,1,1,2-Tetrachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,1-Trichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,2,2-Tetrachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,2-Trichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethene	10.9	09	µg/L	12,397	8260B
VOAs	1,1-Dichloropropanone	<10.0	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichlorobenzene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2,4-Trichlorobenzene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	1,2,4-Trimethylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dibromo-3-chloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dibromoethane (EDB)	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichlorobenzene	5.01	09, 05	µg/L	12,397	8260B
VOAs	1,2-Dichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3,5-Trimethylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3-Dichlorobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,4-Dichlorobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1-Chlorobutane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2,2-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2-Butanone (MEK)	<25.0	09, ND	µg/L	12,397	8260B
VOAs	2-Chlorotoluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2-Hexanone	<10.0	09, ND	µg/L	12,397	8260B
VOAs	2-Nitropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	4-Chlorotoluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	4-Methyl-2-pentanone(MIBK)	<5.00	09, ND	µg/L	12,397	8260B
VOAs	acetone	<100	09, ND	µg/L	12,397	8260B
VOAs	Acrylonitrile	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Allyl Chloride	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Benzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromochloromethane	<5.00	09, ND	µg/L	12,397	8260B

Sample: AB59332



Customer #: 1106740

Facility ID: MOD004954111

County: St. Louis City

Collector: PAM HACKLER

Entry Point:

Sample Comment: Duplicate, grab.

Site: Environmental Operations Inc.

Sample Reference ID:

Affiliation: ESP

Collect Date: 9/6/2011 12:00:00AM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Bromodichloromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromoform	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromomethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	carbon disulfide	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Carbon Tetrachloride	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Chloroacetonitrile	<125	09, ND	µg/L	12,397	8260B
VOAs	Chlorobenzene	939	09	µg/L	12,397	8260B
VOAs	Chloroethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Chloroform	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Chloromethane	<125	09, ND	µg/L	12,397	8260B
VOAs	cis-1,2-dichloroethene	3440	09	µg/L	12,397	8260B
VOAs	cis-1,3-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dibromochloromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dibromomethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dichlorodifluoromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Diethyl ether	<100	09, ND	µg/L	12,397	8260B
VOAs	Ethylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Ethylmethacrylate	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Hexachlorobutadiene	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Hexachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Iodomethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Isopropylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	m&p-Xylenes	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Methacrylonitrile	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Methyl Acrylate	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Methylene chloride	<100	09, ND	µg/L	12,397	8260B
VOAs	Methylmethacrylate	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Methyl-t-butyl ether	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Naphthalene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	n-Butylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Nitrobenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	n-Propylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	o-Xylene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Pentachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	p-isopropyltoluene	<5.00	09, ND	µg/L	12,397	8260B

**Sample: AB59332****Customer #: 1106740****Facility ID:** MOD004954111**County:** St. Louis City**Collector:** PAM HACKLER**Entry Point:****Sample Comment:** Duplicate, grab.**Site:** Environmental Operations Inc.**Sample Reference ID:****Affiliation:** ESP**Collect Date:** 9/6/2011 12:00:00AM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Propionitrile	<100	09, ND	µg/L	12,397	8260B
VOAs	sec-Butylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Styrene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	tert-Butylbenzene	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Tetrachloroethene	3460	09	µg/L	12,397	8260B
VOAs	Tetrahydrofuran	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Toluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Total Xylenes	<10.0	09, ND	µg/L	12,397	8260B
VOAs	trans-1,2-Dichloroethene	79.9	09	µg/L	12,397	8260B
VOAs	trans-1,3-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	trans-1,4-Dichloro-2-butene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Trichloroethene	13400	09	µg/L	12,397	8260B
VOAs	Trichlorofluoromethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Vinyl Chloride	262	09	µg/L	12,397	8260B

**Sample: AB59333****Customer #: 1106756****Facility ID:** MOD004954111**County:** St. Louis City**Collector:** PAM HACKLER**Entry Point:****Sample Comment:** MW-24 B, low-flow peristaltic, clear with black-fine particles, grab.**Site:** Environmental Operations Inc.**Sample Reference ID:****Affiliation:** ESP**Collect Date:** 9/6/2011 5:25:00PM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Carbon Dioxide	Carbon Dioxide	215000	09	ug/L		Contract Lab Dep
Chloride	Chloride	201		mg/L	12,425	SM 4500-Cl-E
Ethane	Ethane	5.93		ug/L		Contract Lab Dep
Ethene	Ethene	<0.25	ND	ug/L		Contract Lab Dep
Field Dissolved Oxygen	Field Dissolved Oxygen	1.16		mg/L		SM 4500-O-G
Field pH	Field pH	7.00		pH Units		EPA 150.1
Field Specific Conductivity	Field Specific Conductivity	2.00 mS/cm				SM 2510
Field Temperature	Field Temperature	23.0 C				EPA 170.1
Field Turbidity	Field Turbidity	19.3		NTU		EPA 180.1
Methane	Methane	3640	09	ug/L		Contract Lab Dep
Nitrate as N	Nitrate as N	0.057		mg/L	12,395	EPA 353.2
Oxidation Reduction Potential-Dissolved	Oxidation Reduction Potential-Dissolved	-144		mV		Not Applicable

**Sample: AB59333****Customer #: 1106756****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** MW-24 B, low-flow peristaltic, clear with black-fine particles, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 5:25:00PM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Sulfate	Sulfate	8.48		mg/L	12,442	EPA 375.2
Sulfide	Sulfide	3.7	03, ND, 04	mg/L	12,708	Contract Lab Dep
Total Alkalinity as CaCO3	Total Alkalinity as CaCO3	865		mg/L	12,429	SM 2320 B
Total Dissolved Solids	Total Dissolved Solids	1210		mg/L	12,483	EPA 180.1
Total Organic Carbon	Total Organic Carbon	30.2	09	mg/L	12,794	SM 5310-C
VOAs	1,1,1,2-Tetrachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,1-Trichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,2,2-Tetrachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1,2-Trichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloropropanone	<10.0	09, ND	µg/L	12,397	8260B
VOAs	1,1-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichlorobenzene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2,4-Trichlorobenzene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	1,2,4-Trimethylbenzene	11.8	09	µg/L	12,397	8260B
VOAs	1,2-Dibromo-3-chloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dibromoethane (EDB)	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichlorobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,2-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3,5-Trimethylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3-Dichlorobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,3-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1,4-Dichlorobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	1-Chlorobutane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2,2-Dichloropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2-Butanone (MEK)	<25.0	09, ND	µg/L	12,397	8260B
VOAs	2-Chlorotoluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	2-Hexanone	<10.0	09, ND	µg/L	12,397	8260B
VOAs	2-Nitropropane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	4-Chlorotoluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	4-Methyl-2-pentanone(MIBK)	<5.00	09, ND	µg/L	12,397	8260B
VOAs	acetone	<100	09, ND	µg/L	12,397	8260B

Sample: AB59333

Facility ID: MOD004954111

Site: Environmental Operations Inc.

County: St. Louis City

Sample Reference ID:

Collector: PAM HACKLER

Affiliation: ESP

Collect Date: 9/6/2011 5:25:00PM

Customer #: 1106756

Entry Point:

Sample Comment: MW-24 B, low-flow peristaltic, clear with black-fine particles, grab.

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Acrylonitrile	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Allyl Chloride	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Benzene	76100	09	µg/L	12,397	8260B
VOAs	Bromobenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromochloromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromodichloromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromoform	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Bromomethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	carbon disulfide	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Carbon Tetrachloride	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Chloroacetonitrile	<125	09, ND	µg/L	12,397	8260B
VOAs	Chlorobenzene	66900	09	µg/L	12,397	8260B
VOAs	Chloroethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Chloroform	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Chloromethane	<125	09, ND	µg/L	12,397	8260B
VOAs	cis-1,2-dichloroethene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	cis-1,3-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dibromochloromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dibromomethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Dichlorodifluoromethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Diethyl ether	<100	09, ND	µg/L	12,397	8260B
VOAs	Ethylbenzene	160	09	µg/L	12,397	8260B
VOAs	Ethylmethacrylate	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Hexachlorobutadiene	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Hexachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Iodomethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Isopropylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	m&p-Xylenes	80.2	09	µg/L	12,397	8260B
VOAs	Methacrylonitrile	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Methyl Acrylate	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Methylene chloride	<100	09, ND	µg/L	12,397	8260B
VOAs	Methylmethacrylate	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Methyl-t-butyl ether	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Naphthalene	<25.0	09, ND	µg/L	12,397	8260B
VOAs	n-Butylbenzene	<5.00	09, ND	µg/L	12,397	8260B

**Sample: AB59333****Customer #: 1106756****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** MW-24 B, low-flow peristaltic, clear with black-fine particles, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 5:25:00PM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Nitrobenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	n-Propylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	o-Xylene	45.4	09	µg/L	12,397	8260B
VOAs	Pentachloroethane	<5.00	09, ND	µg/L	12,397	8260B
VOAs	p-isopropyltoluene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Propionitrile	<100	09, ND	µg/L	12,397	8260B
VOAs	sec-Butylbenzene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Styrene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	tert-Butylbenzene	<10.0	09, ND	µg/L	12,397	8260B
VOAs	Tetrachloroethene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Tetrahydrofuran	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Toluene	298	09	µg/L	12,397	8260B
VOAs	Total Xylenes	126	09	µg/L	12,397	8260B
VOAs	trans-1,2-Dichloroethene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	trans-1,3-Dichloropropene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	trans-1,4-Dichloro-2-butene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Trichloroethene	<5.00	09, ND	µg/L	12,397	8260B
VOAs	Trichlorofluoromethane	<25.0	09, ND	µg/L	12,397	8260B
VOAs	Vinyl Chloride	<5.00	09, ND	µg/L	12,397	8260B

**Sample: AB59334****Customer #: 1106757****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** MW-24A, very strong odor, LNAPL present, pale yellow, low-flow peristaltic purge and sample, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 6:40:00PM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Carbon Dioxide	Carbon Dioxide	226000	09	ug/L		Contract Lab Dep
Chloride	Chloride	117		mg/L	12,426	SM 4500-Cl-E
Ethane	Ethane	15.2		ug/L		Contract Lab Dep
Ethene	Ethene	<0.25	ND	ug/L		Contract Lab Dep
Field Dissolved Oxygen	Field Dissolved Oxygen	1.09		mg/L		SM 4500-O-G
Field pH	Field pH	6.89		pH Units		EPA 150.1
Field Specific Conductivity	Field Specific Conductivity	1453 uS/cm				SM 2510

Sample: AB59334



Customer #: 1106757

Facility ID: MOD004954111

County: St. Louis City

Collector: PAM HACKLER

Entry Point:

Sample Comment: MW-24A, very strong odor, LNAPL present, pale yellow, low-flow peristaltic purge and sample, grab.

Site: Environmental Operations Inc.

Sample Reference ID:

Affiliation: ESP

Collect Date: 9/6/2011 6:40:00PM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Field Temperature	Field Temperature	21.1 C				EPA 170.1
Field Turbidity	Field Turbidity	9.3		NTU		EPA 180.1
Methane	Methane	9860	09	ug/L		Contract Lab Dep
Nitrate as N	Nitrate as N	<0.01	ND	mg/L	12,395	EPA 353.2
Oxidation Reduction Potential-Dissolved	Oxidation Reduction Potential-Dissolved	-139		mV		Not Applicable
Sulfate	Sulfate	6.44		mg/L	12,442	EPA 375.2
Sulfide	Sulfide	<2.0	03, ND, 04	mg/L	12,708	Contract Lab Dep
Total Alkalinity as CaCO3	Total Alkalinity as CaCO3	665		mg/L	12,429	SM 2320 B
Total Dissolved Solids	Total Dissolved Solids	855		mg/L	12,483	EPA 160.1
Total Organic Carbon	Total Organic Carbon	23.4	09	mg/L	12,794	SM 5310-C
VOAs	1,1,1,2-Tetrachloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1,1-Trichloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1,2,2-Tetrachloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1,2-Trichloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1-Dichloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1-Dichloroethene	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,1-Dichloropropanone	<100	09, ND	ug/L	12,397	8260B
VOAs	1,1-Dichloropropene	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,2,3-Trichlorobenzene	<250	09, ND	ug/L	12,397	8260B
VOAs	1,2,3-Trichloropropane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,2,4-Trichlorobenzene	<250	09, ND	ug/L	12,397	8260B
VOAs	1,2,4-Trimethylbenzene	275	09	ug/L	12,397	8260B
VOAs	1,2-Dibromo-3-chloropropane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,2-Dibromoethane (EDB)	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,2-Dichlorobenzene	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,2-Dichloroethane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,2-Dichloropropane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,3,5-Trimethylbenzene	327	09	ug/L	12,397	8260B
VOAs	1,3-Dichlorobenzene	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,3-Dichloropropane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1,4-Dichlorobenzene	<50.0	09, ND	ug/L	12,397	8260B
VOAs	1-Chlorobutane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	2,2-Dichloropropane	<50.0	09, ND	ug/L	12,397	8260B
VOAs	2-Butanone (MEK)	<250	09, ND	ug/L	12,397	8260B
VOAs	2-Chlorotoluene	<50.0	09, ND	ug/L	12,397	8260B

Sample: AB59334



Customer #: 1106757

Facility ID: MOD004954111

County: St. Louis City

Collector: PAM HACKLER

Entry Point:

Sample Comment: MW-24A, very strong odor, LNAPL present, pale yellow, low-flow peristaltic purge and sample, grab.

Site: Environmental Operations Inc.

Sample Reference ID:

Affiliation: ESP

Collect Date: 9/6/2011 6:40:00PM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	2-Hexanone	<100	09, ND	µg/L	12,397	8260B
VOAs	2-Nitropropane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	4-Chlorotoluene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	4-Methyl-2-pentanone(MIBK)	<50.0	09, ND	µg/L	12,397	8260B
VOAs	acetone	<1000	09, ND	µg/L	12,397	8260B
VOAs	Acrylonitrile	<100	09, ND	µg/L	12,397	8260B
VOAs	Allyl Chloride	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Benzene	22900	09	µg/L	12,397	8260B
VOAs	Bromobenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromochloromethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromodichloromethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromoform	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Bromomethane	<250	09, ND	µg/L	12,397	8260B
VOAs	carbon disulfide	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Carbon Tetrachloride	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Chloroacetone	<1250	09, ND	µg/L	12,397	8260B
VOAs	Chlorobenzene	6230	09	µg/L	12,397	8260B
VOAs	Chloroethane	<250	09, ND	µg/L	12,397	8260B
VOAs	Chloroform	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Chloromethane	<1250	09, ND	µg/L	12,397	8260B
VOAs	cis-1,2-dichloroethene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	cis-1,3-Dichloropropene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Dibromochloromethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Dibromomethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Dichlorodifluoromethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Diethyl ether	<1000	09, ND	µg/L	12,397	8260B
VOAs	Ethylbenzene	340	09	µg/L	12,397	8260B
VOAs	Ethylmethacrylate	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Hexachlorobutadiene	<100	09, ND	µg/L	12,397	8260B
VOAs	Hexachloroethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Iodomethane	<250	09, ND	µg/L	12,397	8260B
VOAs	Isopropylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	m&p-Xylenes	333	09	µg/L	12,397	8260B
VOAs	Methacrylonitrile	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Methyl Acrylate	<500	09, ND	µg/L	12,397	8260B

**Sample: AB59334****Customer #: 1106757****Facility ID:** MOD004954111**County:** St. Louis City**Collector:** PAM HACKLER**Entry Point:****Sample Comment:** MW-24A, very strong odor, LNAPL present, pale yellow, low-flow peristaltic purge and sample, grab.**Site:** Environmental Operations Inc.**Sample Reference ID:****Affiliation:** ESP**Collect Date:** 9/6/2011 6:40:00PM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Methylene chloride	<1000	09, ND	µg/L	12,397	8260B
VOAs	Methylmethacrylate	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Methyl-t-butyl ether	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Naphthalene	390	09, 05	µg/L	12,397	8260B
VOAs	n-Butylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Nitrobenzene	<500	09, ND	µg/L	12,397	8260B
VOAs	n-Propylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	o-Xylene	136	09	µg/L	12,397	8260B
VOAs	Pentachloroethane	<50.0	09, ND	µg/L	12,397	8260B
VOAs	p-isopropyltoluene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Propionitrile	<1000	09, ND	µg/L	12,397	8260B
VOAs	sec-Butylbenzene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Styrene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	tert-Butylbenzene	<100	09, ND	µg/L	12,397	8260B
VOAs	Tetrachloroethene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Tetrahydrofuran	<250	09, ND	µg/L	12,397	8260B
VOAs	Toluene	216	09	µg/L	12,397	8260B
VOAs	Total Xylenes	<100	09, ND	µg/L	12,397	8260B
VOAs	trans-1,2-Dichloroethene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	trans-1,3-Dichloropropene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	trans-1,4-Dichloro-2-butene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Trichloroethene	<50.0	09, ND	µg/L	12,397	8260B
VOAs	Trichlorofluoromethane	<250	09, ND	µg/L	12,397	8260B
VOAs	Vinyl Chloride	<50.0	09, ND	µg/L	12,397	8260B

**Sample: AB59335****Customer #: 1106736****Facility ID:** MOD004954111**County:** St. Louis City**Collector:** PAM HACKLER**Entry Point:****Sample Comment:** Trip Blank, grab.**Site:** Environmental Operations Inc.**Sample Reference ID:****Affiliation:** ESP**Collect Date:** 9/6/2011 12:00:00AM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
Total Organic Carbon	Total Organic Carbon	<0.3	ND	mg/L	12,794	SM 5310-C
VOAs	1,1,1,2-Tetrachloroethane	<0.5	ND	µg/L	12,397	8260B

**Sample: AB59335****Customer #: 1106736****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** Trip Blank, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 12:00:00AM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	1,1,1-Trichloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,1,2,2-Tetrachloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,1,2-Trichloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,1-Dichloroethene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,1-Dichloropropanone	<1	ND	µg/L	12,397	8260B
VOAs	1,1-Dichloropropene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichlorobenzene	<2.5	ND	µg/L	12,397	8260B
VOAs	1,2,3-Trichloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2,4-Trichlorobenzene	<2.5	ND	µg/L	12,397	8260B
VOAs	1,2,4-Trimethylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2-Dibromo-3-chloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2-Dibromoethane (EDB)	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2-Dichlorobenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2-Dichloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,2-Dichloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,3,5-Trimethylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,3-Dichlorobenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	1,3-Dichloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	1,4-Dichlorobenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	1-Chlorobutane	<0.5	ND	µg/L	12,397	8260B
VOAs	2,2-Dichloropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	2-Butanone (MEK)	<2.5	ND	µg/L	12,397	8260B
VOAs	2-Chlorotoluene	<0.5	ND	µg/L	12,397	8260B
VOAs	2-Hexanone	<1	ND	µg/L	12,397	8260B
VOAs	2-Nitropropane	<0.5	ND	µg/L	12,397	8260B
VOAs	4-Chlorotoluene	<0.5	ND	µg/L	12,397	8260B
VOAs	4-Methyl-2-pentanone(MIBK)	<0.5	ND	µg/L	12,397	8260B
VOAs	acetone	<10	ND	µg/L	12,397	8260B
VOAs	Acrylonitrile	<1	ND	µg/L	12,397	8260B
VOAs	Allyl Chloride	<0.5	ND	µg/L	12,397	8260B
VOAs	Benzene	<0.5	ND	µg/L	12,397	8260B
VOAs	Bromobenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	Bromochloromethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Bromodichloromethane	<0.5	ND	µg/L	12,397	8260B

Sample: AB59335



Customer #: 1106736

Facility ID: MOD004954111

County: St. Louis City

Collector: PAM HACKLER

Entry Point:

Sample Comment: Trip Blank, grab.

Site: Environmental Operations Inc.

Sample Reference ID:

Affiliation: ESP

Collect Date: 9/6/2011 12:00:00AM

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	Bromoform	<0.5	ND	µg/L	12,397	8260B
VOAs	Bromomethane	<2.5	ND	µg/L	12,397	8260B
VOAs	carbon disulfide	<0.5	ND	µg/L	12,397	8260B
VOAs	Carbon Tetrachloride	<0.5	ND	µg/L	12,397	8260B
VOAs	Chloroacetonitrile	<12.5	ND	µg/L	12,397	8260B
VOAs	Chlorobenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	Chloroethane	<2.5	ND	µg/L	12,397	8260B
VOAs	Chloroform	<0.5	ND	µg/L	12,397	8260B
VOAs	Chloromethane	<12.5	ND	µg/L	12,397	8260B
VOAs	cis-1,2-dichloroethene	<0.5	ND	µg/L	12,397	8260B
VOAs	cis-1,3-Dichloropropene	<0.5	ND	µg/L	12,397	8260B
VOAs	Dibromochloromethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Dibromomethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Dichlorodifluoromethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Diethyl ether	<10	ND	µg/L	12,397	8260B
VOAs	Ethylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	Ethylmethacrylate	<0.5	ND	µg/L	12,397	8260B
VOAs	Hexachlorobutadiene	<1	ND	µg/L	12,397	8260B
VOAs	Hexachloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	Iodomethane	<2.5	ND	µg/L	12,397	8260B
VOAs	Isopropylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	m&p-Xylenes	<0.5	ND	µg/L	12,397	8260B
VOAs	Methacrylonitrile	<0.5	ND	µg/L	12,397	8260B
VOAs	Methyl Acrylate	<5	ND	µg/L	12,397	8260B
VOAs	Methylene chloride	<10	ND	µg/L	12,397	8260B
VOAs	Methylmethacrylate	<0.5	ND	µg/L	12,397	8260B
VOAs	Methyl-t-butyl ether	<0.5	ND	µg/L	12,397	8260B
VOAs	Naphthalene	<2.5	ND	µg/L	12,397	8260B
VOAs	n-Butylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	Nitrobenzene	<5	ND	µg/L	12,397	8260B
VOAs	n-Propylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	o-Xylene	<0.5	ND	µg/L	12,397	8260B
VOAs	Pentachloroethane	<0.5	ND	µg/L	12,397	8260B
VOAs	p-isopropyltoluene	<0.5	ND	µg/L	12,397	8260B
VOAs	Propionitrile	<10	ND	µg/L	12,397	8260B

**Sample: AB59335****Customer #: 1106736****Facility ID: MOD004954111****County: St. Louis City****Collector: PAM HACKLER****Entry Point:****Sample Comment:** Trip Blank, grab.**Site: Environmental Operations Inc.****Sample Reference ID:****Affiliation: ESP****Collect Date: 9/6/2011 12:00:00AM**

Test	Parameter	Result	Qualifier	Units	QC Batch ID	Method
VOAs	sec-Butylbenzene	<0.5	ND	µg/L	12,397	8260B
VOAs	Styrene	<0.5	ND	µg/L	12,397	8260B
VOAs	tert-Butylbenzene	<1	ND	µg/L	12,397	8260B
VOAs	Tetrachloroethene	<0.5	ND	µg/L	12,397	8260B
VOAs	Tetrahydrofuran	<2.5	ND	µg/L	12,397	8260B
VOAs	Toluene	<0.5	ND	µg/L	12,397	8260B
VOAs	Total Xylenes	<1	ND	µg/L	12,397	8260B
VOAs	trans-1,2-Dichloroethene	<0.5	ND	µg/L	12,397	8260B
VOAs	trans-1,3-Dichloropropene	<0.5	ND	µg/L	12,397	8260B
VOAs	trans-1,4-Dichloro-2-butene	<0.5	ND	µg/L	12,397	8260B
VOAs	Trichloroethene	<0.5	ND	µg/L	12,397	8260B
VOAs	Trichlorofluoromethane	<2.5	ND	µg/L	12,397	8260B
VOAs	Vinyl Chloride	<0.5	ND	µg/L	12,397	8260B

The analysis of this sample was performed in accordance with procedures approved or recognized by the U.S Environmental Protection Agency.

**Qualifier Descriptions**

- |  |   |
|--|---|
| 01 Improper collection method                            | 02 Improper preservation                            |
| 03 Exceeded holding time                                 | 04 Analyzed by Contract Laboratory                  |
| 05 Estimated value, detected below PQL                   | 06 Estimated value, QC data outside limits          |
| 07 Estimated value, analyte outside calibration range    | 08 Analyte present in blank at > 1/2 reported value |
| 09 Sample was diluted during analysis                    | 10 Laboratory error                                 |
| 11 Estimated value, matrix interference                  | 12 Insufficient quantity                            |
| 13 Estimated value, true result is >= reported value     | 14 Estimated value, non-homogeneous sample          |
| 15 No Result - Failed Quality Controls Requirements      | 16 Not analyzed - related analyte not detected      |
| 17 Results in dry weight                                 | 18 Sample pH is outside the acceptable range        |
| 19 Estimated value                                       | 20 Not analyzed - Instrument failure                |
| 21 No result - spectral interference                     | 22 pH was performed at the Laboratory               |
| 23 Contract Lab specific qualifier - see sample comments | 24 No result - matrix interference                  |
| 25 No Result: Excessive Chlorination                     | 26 No Result: Excessive Dechlorination              |
| ND Not detected at reported value                        |   |

Chris Boldt, Laboratory Manager  
Environmental Services Program  
Division of Environmental Quality

## **Appendix G**

### **EOI Split Sampling Results**

September 29, 2011

**RECEIVED**

**DEC 13 2011**

Lawrence Rosen  
Environmental Operations, Inc.  
1530 South Second Street  
Suite 200  
Saint Louis, MO 63104

**HAZARDOUS WASTE PROGRAM  
MO DEPT. OF NATURAL RESOURCES**

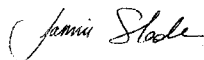
RE: Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706 REVISION, REV-1 9/29/11, Sample IDs for 60105706 002 and 003 corrected

Dear Lawrence Rosen:

Enclosed are the analytical results for sample(s) received by the laboratory on September 08, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Jamie Slade

jamie.slade@pacelabs.com  
Project Manager

Enclosures



**REPORT OF LABORATORY ANALYSIS**

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## CERTIFICATIONS

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

### Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414  
A2LA Certification #: 2926.01  
Alaska Certification #: UST-078  
Alaska Certification #MN00064  
Arizona Certification #: AZ-0014  
Arkansas Certification #: 88-0680  
California Certification #: 01155CA  
EPA Region 8 Certification #: Pace  
Florida/NELAP Certification #: E87605  
Georgia Certification #: 959  
Idaho Certification #: MN00064  
Illinois Certification #: 200011  
Iowa Certification #: 368  
Kansas Certification #: E-10167  
Louisiana Certification #: 03086  
Louisiana Certification #: LA080009  
Maine Certification #: 2007029  
Maryland Certification #: 322  
Michigan DEQ Certification #: 9909  
Minnesota Certification #: 027-053-137

Mississippi Certification #: Pace  
Montana Certification #: MT CERT0092  
Nevada Certification #: MN\_00064  
Nebraska Certification #: Pace  
New Jersey Certification #: MN-002  
New Mexico Certification #: Pace  
New York Certification #: 11647  
North Carolina Certification #: 530  
North Dakota Certification #: R-036  
North Dakota Certification #: R-036A  
Ohio VAP Certification #: CL101  
Oklahoma Certification #: D9921  
Oklahoma Certification #: 9507  
Oregon Certification #: MN200001  
Pennsylvania Certification #: 68-00563  
Puerto Rico Certification  
Tennessee Certification #: 02818  
Texas Certification #: T104704192  
Washington Certification #: C754  
Wisconsin Certification #: 999407970

### Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219  
A2LA Certification #: 2456.01  
Arkansas Certification #: 05-008-0  
Illinois Certification #: 001191  
Iowa Certification #: 118  
Kansas/NELAP Certification #: E-10116

Louisiana Certification #: 03055  
Nevada Certification #: KS000212008A  
Oklahoma Certification #: 9205/9935  
Texas Certification #: T104704407-08-TX  
Utah Certification #: 9135995665

## REPORT OF LABORATORY ANALYSIS

## SAMPLE SUMMARY

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60105706001	LPZ-5-090611	Water	09/06/11 11:38	09/08/11 08:10
60105706002	OBW-1-090611	Water	09/06/11 14:00	09/08/11 08:10
60105706003	REC-4-090612	Water	09/06/11 15:40	09/08/11 08:10
60105706004	MW-24A-090611	Water	09/06/11 18:30	09/08/11 08:10
60105706005	MW-24B-090611	Water	09/06/11 17:20	09/08/11 08:10
60105706006	TRIP BLANK	Water	09/06/11 00:00	09/08/11 08:10

## REPORT OF LABORATORY ANALYSIS

Page 3 of 31

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## SAMPLE ANALYTE COUNT

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60105706001	LPZ-5-090611	RSK 175	SK4	3	PASI-M
		EPA 6010	JGP	2	PASI-K
		EPA 5030B/8260	BRM	22	PASI-K
		SM 2320B	SRM1	1	PASI-K
		SM 2540C	KLB	1	PASI-K
		SM 4500-H+B	JML	1	PASI-K
		EPA 300.0	JPF	2	PASI-K
		EPA 353.2	SRM1	3	PASI-K
		SM 5310C	LAJ	1	PASI-K
		SM 4500-CO2 D	CMG	1	PASI-K
60105706002	OBW-1-090611	RSK 175	SK4	3	PASI-M
		EPA 6010	JGP	2	PASI-K
		EPA 5030B/8260	BRM	22	PASI-K
		SM 2320B	SRM1	1	PASI-K
		SM 2540C	KLB	1	PASI-K
		SM 4500-H+B	JML	1	PASI-K
		EPA 300.0	JPF	2	PASI-K
		EPA 353.2	SRM1	3	PASI-K
		SM 5310C	LAJ	1	PASI-K
		SM 4500-CO2 D	CMG	1	PASI-K
60105706003	REC-4-090612	RSK 175	SK4	3	PASI-M
		EPA 6010	JGP	2	PASI-K
		EPA 5030B/8260	BRM	22	PASI-K
		SM 2320B	SRM1	1	PASI-K
		SM 2540C	KLB	1	PASI-K
		SM 4500-H+B	JML	1	PASI-K
		EPA 300.0	JPF	2	PASI-K
		EPA 353.2	SRM1	3	PASI-K
		SM 5310C	LAJ	1	PASI-K
		SM 4500-CO2 D	CMG	1	PASI-K
60105706004	MW-24A-090611	RSK 175	SK4	3	PASI-M
		EPA 6010	JGP	2	PASI-K
		EPA 5030B/8260	BRM	22	PASI-K
		SM 2320B	SRM1	1	PASI-K
		SM 2540C	KLB	1	PASI-K
		SM 4500-H+B	JML	1	PASI-K
		EPA 300.0	JPF	2	PASI-K

## REPORT OF LABORATORY ANALYSIS

Page 4 of 31

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# SAMPLE ANALYTE COUNT

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60105706005	MW-24B-090611	EPA 353.2	SRM1	3	PASI-K
		SM 5310C	LAJ	1	PASI-K
		SM 4500-CO2 D	CMG	1	PASI-K
		RSK 175	SK4	3	PASI-M
		EPA 6010	JGP	2	PASI-K
		EPA 5030B/8260	BRM	22	PASI-K
		SM 2320B	SRM1	1	PASI-K
		SM 2540C	KLB	1	PASI-K
		SM 4500-H+B	JML	1	PASI-K
		EPA 300.0	JPF	2	PASI-K
		EPA 353.2	SRM1	3	PASI-K
		SM 5310C	LAJ	1	PASI-K
		SM 4500-CO2 D	CMG	1	PASI-K
60105706006	TRIP BLANK	EPA 5030B/8260	HMW	22	PASI-K

## REPORT OF LABORATORY ANALYSIS

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

Sample: LPZ-5-090611		Lab ID: 60105706001	Collected: 09/06/11 11:38	Received: 09/08/11 08:10	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>RSK 175 AIR Headspace</b>		Analytical Method: RSK 175						
Ethane	66.0 ug/L		10.0	1		09/14/11 11:27	74-84-0	
Ethene	209 ug/L		10.0	1		09/14/11 11:27	74-85-1	
Methane	11100 ug/L		10.0	1		09/14/11 11:27	74-82-8	1e,E
<b>6010 MET ICP</b>		Analytical Method: EPA 6010 Preparation Method: EPA 3010						
Iron	2020 ug/L		50.0	1	09/13/11 12:45	09/14/11 13:34	7439-89-6	
Manganese	1580 ug/L		5.0	1	09/13/11 12:45	09/14/11 13:34	7439-96-5	
<b>8260 MSV</b>		Analytical Method: EPA 5030B/8260						
Acetone	ND ug/L		10.0	1		09/20/11 18:34	67-64-1	
Benzene	ND ug/L		1.0	1		09/20/11 18:34	71-43-2	
Carbon disulfide	ND ug/L		5.0	1		09/20/11 18:34	75-15-0	
Chlorobenzene	ND ug/L		1.0	1		09/20/11 18:34	108-90-7	
Chloroform	1.0 ug/L		1.0	1		09/20/11 18:34	67-66-3	B+
1,2-Dichloroethane	ND ug/L		1.0	1		09/20/11 18:34	107-06-2	
cis-1,2-Dichloroethene	12.0 ug/L		1.0	1		09/20/11 18:34	156-59-2	
trans-1,2-Dichloroethene	ND ug/L		1.0	1		09/20/11 18:34	156-60-5	L3
Ethylbenzene	ND ug/L		1.0	1		09/20/11 18:34	100-41-4	
Iodomethane	ND ug/L		10.0	1		09/20/11 18:34	74-88-4	
Methylene chloride	2.0 ug/L		1.0	1		09/20/11 18:34	75-09-2	L1,Z3
Tetrachloroethene	ND ug/L		1.0	1		09/20/11 18:34	127-18-4	
Toluene	157 ug/L		1.0	1		09/20/11 18:34	108-88-3	
1,1,1-Trichloroethane	ND ug/L		1.0	1		09/20/11 18:34	71-55-6	
Trichloroethene	ND ug/L		1.0	1		09/20/11 18:34	79-01-6	
Vinyl chloride	ND ug/L		1.0	1		09/20/11 18:34	75-01-4	
Xylene (Total)	ND ug/L		3.0	1		09/20/11 18:34	1330-20-7	
4-Bromofluorobenzene (S)	100 %		87-113	1		09/20/11 18:34	460-00-4	
Dibromofluoromethane (S)	99 %		86-112	1		09/20/11 18:34	1868-53-7	
1,2-Dichloroethane-d4 (S)	100 %		82-119	1		09/20/11 18:34	17060-07-0	
Toluene-d8 (S)	98 %		90-110	1		09/20/11 18:34	2037-26-5	
Preservation pH	1.0		0.10	1		09/20/11 18:34		
<b>2320B Alkalinity</b>		Analytical Method: SM 2320B						
Alkalinity, Total as CaCO3	1450 mg/L		20.0	1		09/20/11 14:26		
<b>2540C Total Dissolved Solids</b>		Analytical Method: SM 2540C						
Total Dissolved Solids	2670 mg/L		5.0	1		09/13/11 08:30		
<b>4500H+ pH, Electrometric</b>		Analytical Method: SM 4500-H+B						
pH at 25 Degrees C	9.2 Std. Units		0.10	1		09/09/11 17:00		H6
<b>300.0 IC Anions 28 Days</b>		Analytical Method: EPA 300.0						
Chloride	312 mg/L		50.0	50		09/22/11 17:14	16887-00-6	
Sulfate	18.4 mg/L		2.0	2		09/23/11 15:18	14808-79-8	



Pace Analytical Services, Inc.  
9608 Loiret Blvd.  
Lenexa, KS 66219  
(913)599-5665

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

<b>Sample: LPZ-5-090611</b>		<b>Lab ID: 60105706001</b>	Collected: 09/06/11 11:38		Received: 09/08/11 08:10		Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>353.2 Nitrogen, NO2/NO3 pres.</b>		Analytical Method: EPA 353.2						
Nitrogen, Nitrate	ND	mg/L	0.10	1		09/20/11 13:46		
Nitrogen, Nitrite	ND	mg/L	0.10	1		09/20/11 13:46		
Nitrogen, NO2 plus NO3	ND	mg/L	0.10	1		09/20/11 13:46		
<b>5310C TOC</b>		Analytical Method: SM 5310C						
Total Organic Carbon	372	mg/L	10.0	1		09/15/11 20:51	7440-44-0	
<b>Carbon Dioxide Calculation</b>		Analytical Method: SM 4500-CO2 D						
Carbon dioxide	1210	mg/L	20.0	1		09/20/11 15:00	124-38-9	

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

Sample: OBW-1-090611		Lab ID: 60105706002	Collected: 09/06/11 14:00		Received: 09/08/11 08:10		Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>RSK 175 AIR Headspace</b>		Analytical Method: RSK 175						
Ethane	20.3 ug/L		10.0	1		09/14/11 10:25	74-84-0	
Ethene	49.0 ug/L		10.0	1		09/14/11 10:25	74-85-1	
Methane	703 ug/L		10.0	1		09/14/11 10:25	74-82-8	1e
<b>6010 MET ICP</b>		Analytical Method: EPA 6010 Preparation Method: EPA 3010						
Iron	ND ug/L		50.0	1	09/13/11 12:45	09/14/11 13:37	7439-89-6	
Manganese	ND ug/L		5.0	1	09/13/11 12:45	09/14/11 13:37	7439-96-5	
<b>8260 MSV</b>		Analytical Method: EPA 5030B/8260						
Acetone	ND ug/L		10.0	1		09/20/11 18:50	67-64-1	
Benzene	ND ug/L		1.0	1		09/20/11 18:50	71-43-2	
Carbon disulfide	ND ug/L		5.0	1		09/20/11 18:50	75-15-0	
Chlorobenzene	4.5 ug/L		1.0	1		09/20/11 18:50	108-90-7	
Chloroform	ND ug/L		1.0	1		09/20/11 18:50	67-66-3	
1,2-Dichloroethane	ND ug/L		1.0	1		09/20/11 18:50	107-06-2	
cis-1,2-Dichloroethene	5.8 ug/L		1.0	1		09/20/11 18:50	156-59-2	
trans-1,2-Dichloroethene	ND ug/L		1.0	1		09/20/11 18:50	156-60-5	L3
Ethylbenzene	ND ug/L		1.0	1		09/20/11 18:50	100-41-4	
Iodomethane	ND ug/L		10.0	1		09/20/11 18:50	74-88-4	
Methylene chloride	2.4 ug/L		1.0	1		09/20/11 18:50	75-09-2	L1,Z3
Tetrachloroethene	60.5 ug/L		1.0	1		09/20/11 18:50	127-18-4	
Toluene	2.1 ug/L		1.0	1		09/20/11 18:50	108-88-3	
1,1,1-Trichloroethane	ND ug/L		1.0	1		09/20/11 18:50	71-55-6	
Trichloroethene	3.6 ug/L		1.0	1		09/20/11 18:50	79-01-6	
Vinyl chloride	ND ug/L		1.0	1		09/20/11 18:50	75-01-4	
Xylene (Total)	ND ug/L		3.0	1		09/20/11 18:50	1330-20-7	
4-Bromofluorobenzene (S)	100 %		87-113	1		09/20/11 18:50	460-00-4	
Dibromofluoromethane (S)	101 %		86-112	1		09/20/11 18:50	1868-53-7	
1,2-Dichloroethane-d4 (S)	101 %		82-119	1		09/20/11 18:50	17060-07-0	
Toluene-d8 (S)	100 %		90-110	1		09/20/11 18:50	2037-26-5	
Preservation pH	1.0		0.10	1		09/20/11 18:50		
<b>2320B Alkalinity</b>		Analytical Method: SM 2320B						
Alkalinity, Total as CaCO3	74.1 mg/L		20.0	1		09/20/11 14:26		
<b>2540C Total Dissolved Solids</b>		Analytical Method: SM 2540C						
Total Dissolved Solids	985 mg/L		5.0	1		09/13/11 08:30		
<b>4500H+ pH, Electrometric</b>		Analytical Method: SM 4500-H+B						
pH at 25 Degrees C	11.7 Std. Units		0.10	1		09/09/11 17:00		H6
<b>300.0 IC Anions 28 Days</b>		Analytical Method: EPA 300.0						
Chloride	384 mg/L		50.0	50		09/22/11 18:00	16887-00-6	
Sulfate	131 mg/L		20.0	20		09/22/11 17:44	14808-79-8	

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

Sample: OBW-1-090611		Lab ID: 60105706002	Collected: 09/06/11 14:00	Received: 09/08/11 08:10	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>353.2 Nitrogen, NO<sub>2</sub>/NO<sub>3</sub> pres.</b>		Analytical Method: EPA 353.2						
Nitrogen, Nitrate	ND	mg/L	0.10	1		09/20/11 13:46		
Nitrogen, Nitrite	ND	mg/L	0.10	1		09/20/11 13:46		
Nitrogen, NO <sub>2</sub> plus NO <sub>3</sub>	ND	mg/L	0.10	1		09/20/11 13:46		
<b>5310C TOC</b>		Analytical Method: SM 5310C						
Total Organic Carbon	13.4	mg/L	1.0	1		09/15/11 21:05	7440-44-0	
<b>Carbon Dioxide Calculation</b>		Analytical Method: SM 4500-CO <sub>2</sub> D						
Carbon dioxide	51.8	mg/L	20.0	1		09/20/11 15:00	124-38-9	

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

Sample: REC-4-090612		Lab ID: 60105706003	Collected: 09/06/11 15:40	Received: 09/08/11 08:10	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>RSK 175 AIR Headspace</b>		Analytical Method: RSK 175						
Ethane	ND ug/L		10.0	1		09/14/11 10:46	74-84-0	
Ethene	10.8 ug/L		10.0	1		09/14/11 10:46	74-85-1	
Methane	289 ug/L		10.0	1		09/14/11 10:46	74-82-8	1e
<b>6010 MET ICP</b>		Analytical Method: EPA 6010 Preparation Method: EPA 3010						
Iron	8940 ug/L		50.0	1	09/13/11 12:45	09/14/11 13:40	7439-89-6	
Manganese	2350 ug/L		5.0	1	09/13/11 12:45	09/14/11 13:40	7439-96-5	
<b>8260 MSV</b>		Analytical Method: EPA 5030B/8260						
Acetone	ND ug/L		10.0	1		09/20/11 19:07	67-64-1	
Benzene	ND ug/L		1.0	1		09/20/11 19:07	71-43-2	
Carbon disulfide	ND ug/L		5.0	1		09/20/11 19:07	75-15-0	
Chlorobenzene	ND ug/L		1.0	1		09/20/11 19:07	108-90-7	
Chloroform	1.0 ug/L		1.0	1		09/20/11 19:07	67-66-3	B+
1,2-Dichloroethane	ND ug/L		1.0	1		09/20/11 19:07	107-06-2	
cis-1,2-Dichloroethene	2.0 ug/L		1.0	1		09/20/11 19:07	156-59-2	
trans-1,2-Dichloroethene	ND ug/L		1.0	1		09/20/11 19:07	156-60-5	L3
Ethylbenzene	ND ug/L		1.0	1		09/20/11 19:07	100-41-4	
Iodomethane	ND ug/L		10.0	1		09/20/11 19:07	74-88-4	
Methylene chloride	3.4 ug/L		1.0	1		09/20/11 19:07	75-09-2	L1,Z3
Tetrachloroethene	2.6 ug/L		1.0	1		09/20/11 19:07	127-18-4	
Toluene	ND ug/L		1.0	1		09/20/11 19:07	108-88-3	
1,1,1-Trichloroethane	ND ug/L		1.0	1		09/20/11 19:07	71-55-6	
Trichloroethene	4.0 ug/L		1.0	1		09/20/11 19:07	79-01-6	
Vinyl chloride	ND ug/L		1.0	1		09/20/11 19:07	75-01-4	
Xylene (Total)	ND ug/L		3.0	1		09/20/11 19:07	1330-20-7	
4-Bromofluorobenzene (S)	98 %		87-113	1		09/20/11 19:07	460-00-4	
Dibromofluoromethane (S)	100 %		86-112	1		09/20/11 19:07	1868-53-7	
1,2-Dichloroethane-d4 (S)	99 %		82-119	1		09/20/11 19:07	17060-07-0	
Toluene-d8 (S)	99 %		90-110	1		09/20/11 19:07	2037-26-5	
Preservation pH	1.0		0.10	1		09/20/11 19:07		
<b>2320B Alkalinity</b>		Analytical Method: SM 2320B						
Alkalinity, Total as CaCO3	475 mg/L		20.0	1		09/20/11 14:26		
<b>2540C Total Dissolved Solids</b>		Analytical Method: SM 2540C						
Total Dissolved Solids	1410 mg/L		5.0	1		09/13/11 08:31		
<b>4500H+ pH, Electrometric</b>		Analytical Method: SM 4500-H+B						
pH at 25 Degrees C	7.0 Std. Units		0.10	1		09/09/11 17:00		H6
<b>300.0 IC Anions 28 Days</b>		Analytical Method: EPA 300.0						
Chloride	415 mg/L		50.0	50		09/22/11 18:45	16887-00-6	
Sulfate	230 mg/L		50.0	50		09/22/11 18:45	14808-79-8	

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

Sample: REC-4-090612		Lab ID: 60105706003	Collected: 09/06/11 15:40	Received: 09/08/11 08:10	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>353.2 Nitrogen, NO2/NO3 pres.</b>		Analytical Method: EPA 353.2						
Nitrogen, Nitrate	ND	mg/L	0.10	1		09/20/11 13:49		
Nitrogen, Nitrite	ND	mg/L	0.10	1		09/20/11 13:49		
Nitrogen, NO2 plus NO3	ND	mg/L	0.10	1		09/20/11 13:49		
<b>5310C TOC</b>		Analytical Method: SM 5310C						
Total Organic Carbon	3.5	mg/L	1.0	1		09/15/11 21:19	7440-44-0	
<b>Carbon Dioxide Calculation</b>		Analytical Method: SM 4500-CO2 D						
Carbon dioxide	513	mg/L	20.0	1		09/20/11 15:00	124-38-9	

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

Sample: MW-24A-090611		Lab ID: 60105706004		Collected: 09/06/11 18:30		Received: 09/08/11 08:10		Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
RSK 175 AIR Headspace		Analytical Method: RSK 175							
Ethane	ND	ug/L	10.0	1		09/14/11 11:06	74-84-0		
Ethene	ND	ug/L	10.0	1		09/14/11 11:06	74-85-1		
Methane	4020	ug/L	10.0	1		09/14/11 11:06	74-82-8	1e	
6010 MET ICP		Analytical Method: EPA 6010 Preparation Method: EPA 3010							
Iron	33400	ug/L	50.0	1	09/13/11 12:45	09/14/11 13:50	7439-89-6		
Manganese	2430	ug/L	5.0	1	09/13/11 12:45	09/14/11 13:50	7439-96-5		
8260 MSV		Analytical Method: EPA 5030B/8260							
Acetone	ND	ug/L	10.0	1		09/20/11 19:24	67-64-1		
Benzene	91.8	ug/L	1.0	1		09/20/11 19:24	71-43-2		
Carbon disulfide	ND	ug/L	5.0	1		09/20/11 19:24	75-15-0		
Chlorobenzene	83.7	ug/L	1.0	1		09/20/11 19:24	108-90-7		
Chloroform	1.1	ug/L	1.0	1		09/20/11 19:24	67-66-3	B+	
1,2-Dichloroethane	ND	ug/L	1.0	1		09/20/11 19:24	107-06-2		
cis-1,2-Dichloroethene	ND	ug/L	1.0	1		09/20/11 19:24	156-59-2		
trans-1,2-Dichloroethene	ND	ug/L	1.0	1		09/20/11 19:24	156-60-5	L3	
Ethylbenzene	ND	ug/L	1.0	1		09/20/11 19:24	100-41-4		
Iodomethane	ND	ug/L	10.0	1		09/20/11 19:24	74-88-4		
Methylene chloride	3.1	ug/L	1.0	1		09/20/11 19:24	75-09-2	L1,Z3	
Tetrachloroethene	ND	ug/L	1.0	1		09/20/11 19:24	127-18-4		
Toluene	ND	ug/L	1.0	1		09/20/11 19:24	108-88-3		
1,1,1-Trichloroethane	ND	ug/L	1.0	1		09/20/11 19:24	71-55-6		
Trichloroethene	ND	ug/L	1.0	1		09/20/11 19:24	79-01-6		
Vinyl chloride	ND	ug/L	1.0	1		09/20/11 19:24	75-01-4		
Xylene (Total)	ND	ug/L	3.0	1		09/20/11 19:24	1330-20-7		
4-Bromofluorobenzene (S)	99 %		87-113	1		09/20/11 19:24	460-00-4		
Dibromofluoromethane (S)	101 %		86-112	1		09/20/11 19:24	1868-53-7		
1,2-Dichloroethane-d4 (S)	103 %		82-119	1		09/20/11 19:24	17060-07-0		
Toluene-d8 (S)	99 %		90-110	1		09/20/11 19:24	2037-26-5		
Preservation pH	1.0		0.10	1		09/20/11 19:24			
2320B Alkalinity		Analytical Method: SM 2320B							
Alkalinity, Total as CaCO3	674	mg/L	20.0	1		09/20/11 14:26			
2540C Total Dissolved Solids		Analytical Method: SM 2540C							
Total Dissolved Solids	814	mg/L	5.0	1		09/13/11 08:32			
4500H+ pH, Electrometric		Analytical Method: SM 4500-H+B							
pH at 25 Degrees C	7.0	Std. Units	0.10	1		09/09/11 17:00		H6	
300.0 IC Anions 28 Days		Analytical Method: EPA 300.0							
Chloride	98.8	mg/L	20.0	20		09/23/11 15:49	16887-00-6		
Sulfate	ND	mg/L	1.0	1		09/23/11 15:33	14808-79-8		

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

Sample: MW-24A-090611		Lab ID: 60105706004	Collected: 09/06/11 18:30	Received: 09/08/11 08:10	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2						
Nitrogen, Nitrate	ND	mg/L	0.10	1		09/20/11 13:50		
Nitrogen, Nitrite	ND	mg/L	0.10	1		09/20/11 13:50		
Nitrogen, NO2 plus NO3	0.10	mg/L	0.10	1		09/20/11 13:50		
5310C TOC		Analytical Method: SM 5310C						
Total Organic Carbon	22.7	mg/L	1.0	1		09/15/11 21:34	7440-44-0	
Carbon Dioxide Calculation		Analytical Method: SM 4500-CO2 D						
Carbon dioxide	728	mg/L	20.0	1		09/20/11 15:00	124-38-9	

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

Sample: MW-24B-090611		Lab ID: 60105706005	Collected: 09/06/11 17:20	Received: 09/08/11 08:10	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>RSK 175 AIR Headspace</b>		Analytical Method: RSK 175						
Ethane	12.1 ug/L		10.0	1		09/14/11 11:17	74-84-0	
Ethene	ND ug/L		10.0	1		09/14/11 11:17	74-85-1	
Methane	9240 ug/L		10.0	1		09/14/11 11:17	74-82-8	1e,E
<b>6010 MET ICP</b>		Analytical Method: EPA 6010 Preparation Method: EPA 3010						
Iron	41000 ug/L		50.0	1	09/13/11 12:45	09/14/11 13:53	7439-89-6	
Manganese	763 ug/L		5.0	1	09/13/11 12:45	09/14/11 13:53	7439-96-5	
<b>8260 MSV</b>		Analytical Method: EPA 5030B/8260						
Acetone	ND ug/L		10.0	1		09/20/11 19:40	67-64-1	
Benzene	161 ug/L		1.0	1		09/20/11 19:40	71-43-2	
Carbon disulfide	ND ug/L		5.0	1		09/20/11 19:40	75-15-0	
Chlorobenzene	30.0 ug/L		1.0	1		09/20/11 19:40	108-90-7	
Chloroform	1.0 ug/L		1.0	1		09/20/11 19:40	67-66-3	B+
1,2-Dichloroethane	ND ug/L		1.0	1		09/20/11 19:40	107-06-2	
cis-1,2-Dichloroethene	ND ug/L		1.0	1		09/20/11 19:40	156-59-2	
trans-1,2-Dichloroethene	ND ug/L		1.0	1		09/20/11 19:40	156-60-5	L3
Ethylbenzene	5.0 ug/L		1.0	1		09/20/11 19:40	100-41-4	
Iodomethane	ND ug/L		10.0	1		09/20/11 19:40	74-88-4	
Methylene chloride	3.1 ug/L		1.0	1		09/20/11 19:40	75-09-2	L1,Z3
Tetrachloroethene	ND ug/L		1.0	1		09/20/11 19:40	127-18-4	
Toluene	1.7 ug/L		1.0	1		09/20/11 19:40	108-88-3	
1,1,1-Trichloroethane	ND ug/L		1.0	1		09/20/11 19:40	71-55-6	
Trichloroethene	ND ug/L		1.0	1		09/20/11 19:40	79-01-6	
Vinyl chloride	ND ug/L		1.0	1		09/20/11 19:40	75-01-4	
Xylene (Total)	6.8 ug/L		3.0	1		09/20/11 19:40	1330-20-7	
4-Bromofluorobenzene (S)	99 %		87-113	1		09/20/11 19:40	460-00-4	
Dibromofluoromethane (S)	100 %		86-112	1		09/20/11 19:40	1868-53-7	
1,2-Dichloroethane-d4 (S)	101 %		82-119	1		09/20/11 19:40	17060-07-0	
Toluene-d8 (S)	98 %		90-110	1		09/20/11 19:40	2037-26-5	
Preservation pH	1.0		0.10	1		09/20/11 19:40		
<b>2320B Alkalinity</b>		Analytical Method: SM 2320B						
Alkalinity, Total as CaCO3	874 mg/L		20.0	1		09/20/11 14:26		
<b>2540C Total Dissolved Solids</b>		Analytical Method: SM 2540C						
Total Dissolved Solids	1180 mg/L		5.0	1		09/13/11 08:32		
<b>4500H+ pH, Electrometric</b>		Analytical Method: SM 4500-H+B						
pH at 25 Degrees C	7.1 Std. Units		0.10	1		09/09/11 17:00		H6
<b>300.0 IC Anions 28 Days</b>		Analytical Method: EPA 300.0						
Chloride	193 mg/L		20.0	20		09/22/11 19:46	16887-00-6	
Sulfate	1.0 mg/L		1.0	1		09/22/11 19:31	14808-79-8	

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

Sample: MW-24B-090611		Lab ID: 60105706005	Collected: 09/06/11 17:20	Received: 09/08/11 08:10	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>353.2 Nitrogen, NO2/NO3 pres.</b>		Analytical Method: EPA 353.2						
Nitrogen, Nitrate	ND	mg/L	0.10	1		09/20/11 13:51		
Nitrogen, Nitrite	ND	mg/L	0.10	1		09/20/11 13:51		
Nitrogen, NO2 plus NO3	ND	mg/L	0.10	1		09/20/11 13:51		
<b>5310C TOC</b>		Analytical Method: SM 5310C						
Total Organic Carbon	39.5	mg/L	1.0	1		09/15/11 21:48	7440-44-0	
<b>Carbon Dioxide Calculation</b>		Analytical Method: SM 4500-CO2 D						
Carbon dioxide	908	mg/L	20.0	1		09/20/11 15:00	124-38-9	

## ANALYTICAL RESULTS

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

Sample: TRIP BLANK		Lab ID: 60105706006	Collected: 09/06/11 00:00	Received: 09/08/11 08:10	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV		Analytical Method: EPA 5030B/8260						
Acetone	ND	ug/L	10.0	1		09/18/11 15:12	67-64-1	
Benzene	ND	ug/L	1.0	1		09/18/11 15:12	71-43-2	
Carbon disulfide	ND	ug/L	5.0	1		09/18/11 15:12	75-15-0	
Chlorobenzene	ND	ug/L	1.0	1		09/18/11 15:12	108-90-7	
Chloroform	ND	ug/L	1.0	1		09/18/11 15:12	67-66-3	
1,2-Dichloroethane	ND	ug/L	1.0	1		09/18/11 15:12	107-06-2	
cis-1,2-Dichloroethene	ND	ug/L	1.0	1		09/18/11 15:12	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	1		09/18/11 15:12	156-60-5	
Ethylbenzene	ND	ug/L	1.0	1		09/18/11 15:12	100-41-4	
Iodomethane	ND	ug/L	10.0	1		09/18/11 15:12	74-88-4	
Methylene chloride	ND	ug/L	1.0	1		09/18/11 15:12	75-09-2	
Tetrachloroethene	ND	ug/L	1.0	1		09/18/11 15:12	127-18-4	
Toluene	ND	ug/L	1.0	1		09/18/11 15:12	108-88-3	
1,1,1-Trichloroethane	ND	ug/L	1.0	1		09/18/11 15:12	71-55-6	
Trichloroethene	ND	ug/L	1.0	1		09/18/11 15:12	79-01-6	
Vinyl chloride	ND	ug/L	1.0	1		09/18/11 15:12	75-01-4	
Xylene (Total)	ND	ug/L	3.0	1		09/18/11 15:12	1330-20-7	
4-Bromofluorobenzene (S)	107 %		87-113	1		09/18/11 15:12	460-00-4	
Dibromofluoromethane (S)	108 %		86-112	1		09/18/11 15:12	1868-53-7	
1,2-Dichloroethane-d4 (S)	101 %		82-119	1		09/18/11 15:12	17060-07-0	
Toluene-d8 (S)	106 %		90-110	1		09/18/11 15:12	2037-26-5	
Preservation pH	1.0		0.10	1		09/18/11 15:12		

### QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: AIR/13131 Analysis Method: RSK 175  
QC Batch Method: RSK 175 Analysis Description: RSK 175 AIR HEADSPACE  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

METHOD BLANK: 1053249 Matrix: Water  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethane	ug/L	ND	10.0	09/14/11 10:14	
Ethene	ug/L	ND	10.0	09/14/11 10:14	
Methane	ug/L	ND	10.0	09/14/11 10:14	

LABORATORY CONTROL SAMPLE & LCSD: 1053250		1053251								
Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Ethane	ug/L	114	104	118	91	104	70-130	13	30	
Ethene	ug/L	106	99.2	111	93	104	70-130	11	30	
Methane	ug/L	60.7	58.6	61.2	97	101	70-130	4	30	

SAMPLE DUPLICATE: 1054171

Parameter	Units	60105706002 Result	Dup Result	RPD	Max RPD	Qualifiers
Ethane	ug/L	20.3	25.8	24	30	
Ethene	ug/L	49.0	59.5	19	30	
Methane	ug/L	703	918	26	30 1e	

SAMPLE DUPLICATE: 1054643

Parameter	Units	10168951001 Result	Dup Result	RPD	Max RPD	Qualifiers
Ethane	ug/L	ND	ND		30	
Ethene	ug/L	ND	ND		30	
Methane	ug/L	2950	3160	7	30	

### QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: MPRP/15279 Analysis Method: EPA 6010  
QC Batch Method: EPA 3010 Analysis Description: 6010 MET  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

METHOD BLANK: 874278 Matrix: Water  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Iron	ug/L	ND	50.0	09/14/11 13:14	
Manganese	ug/L	ND	5.0	09/14/11 13:14	

LABORATORY CONTROL SAMPLE: 874279

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Iron	ug/L	10000	10100	101	80-120	
Manganese	ug/L	1000	1000	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 874280 874281

Parameter	Units	60105687001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	Max RPD	Qual
Iron	ug/L	3540	10000	10000	13100	13300	96	97	75-125	1	20
Manganese	ug/L	62.5	1000	1000	1040	1050	98	99	75-125	1	20

## QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: MSV/40140 Analysis Method: EPA 5030B/8260  
QC Batch Method: EPA 5030B/8260 Analysis Description: 8260 MSV Water 10 mL Purge  
Associated Lab Samples: 60105706006

METHOD BLANK: 877402 Matrix: Water

Associated Lab Samples: 60105706006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1-Trichloroethane	ug/L	ND	1.0	09/18/11 14:03	
1,2-Dichloroethane	ug/L	ND	1.0	09/18/11 14:03	
Acetone	ug/L	ND	10.0	09/18/11 14:03	
Benzene	ug/L	ND	1.0	09/18/11 14:03	
Carbon disulfide	ug/L	ND	5.0	09/18/11 14:03	
Chlorobenzene	ug/L	ND	1.0	09/18/11 14:03	
Chloroform	ug/L	ND	1.0	09/18/11 14:03	
cis-1,2-Dichloroethene	ug/L	ND	1.0	09/18/11 14:03	
Ethylbenzene	ug/L	ND	1.0	09/18/11 14:03	
Iodomethane	ug/L	ND	10.0	09/18/11 14:03	
Methylene chloride	ug/L	ND	1.0	09/18/11 14:03	
Tetrachloroethene	ug/L	ND	1.0	09/18/11 14:03	
Toluene	ug/L	ND	1.0	09/18/11 14:03	
trans-1,2-Dichloroethene	ug/L	ND	1.0	09/18/11 14:03	
Trichloroethene	ug/L	ND	1.0	09/18/11 14:03	
Vinyl chloride	ug/L	ND	1.0	09/18/11 14:03	
Xylene (Total)	ug/L	ND	3.0	09/18/11 14:03	
1,2-Dichloroethane-d4 (S)	%	104	82-119	09/18/11 14:03	
4-Bromofluorobenzene (S)	%	105	87-113	09/18/11 14:03	
Dibromofluoromethane (S)	%	106	86-112	09/18/11 14:03	
Toluene-d8 (S)	%	107	90-110	09/18/11 14:03	

LABORATORY CONTROL SAMPLE: 877403

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1-Trichloroethane	ug/L	20	19.9	99	82-119	
1,2-Dichloroethane	ug/L	20	21.1	105	77-125	
Acetone	ug/L	100	109	109	18-192	
Benzene	ug/L	20	18.0	90	82-117	
Carbon disulfide	ug/L	20	19.1	96	75-138	
Chlorobenzene	ug/L	20	20.0	100	83-121	
Chloroform	ug/L	20	18.9	95	82-116	
cis-1,2-Dichloroethene	ug/L	20	18.7	94	80-119	
Ethylbenzene	ug/L	20	19.6	98	79-121	
Iodomethane	ug/L	20	25.1	125	14-169	
Methylene chloride	ug/L	20	19.7	99	75-118	
Tetrachloroethene	ug/L	20	20.6	103	80-124	
Toluene	ug/L	20	20.8	104	80-120	
trans-1,2-Dichloroethene	ug/L	20	19.9	99	79-120	
Trichloroethene	ug/L	20	18.6	93	76-122	
Vinyl chloride	ug/L	20	16.1	80	57-163	

Date: 09/29/2011 01:50 PM

## REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

LABORATORY CONTROL SAMPLE: 877403

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Xylene (Total)	ug/L	60	63.7	106	75-120	
1,2-Dichloroethane-d4 (S)	%			103	82-119	
4-Bromofluorobenzene (S)	%			103	87-113	
Dibromofluoromethane (S)	%			106	86-112	
Toluene-d8 (S)	%			96	90-110	

## QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: MSV/40186 Analysis Method: EPA 5030B/8260  
QC Batch Method: EPA 5030B/8260 Analysis Description: 8260 MSV Water 10 mL Purge  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

METHOD BLANK: 878040

Matrix: Water

Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1-Trichloroethane	ug/L	ND	1.0	09/20/11 18:17	
1,2-Dichloroethane	ug/L	ND	1.0	09/20/11 18:17	
Acetone	ug/L	ND	10.0	09/20/11 18:17	
Benzene	ug/L	ND	1.0	09/20/11 18:17	
Carbon disulfide	ug/L	ND	5.0	09/20/11 18:17	
Chlorobenzene	ug/L	ND	1.0	09/20/11 18:17	
Chloroform	ug/L	1.2	1.0	09/20/11 18:17	B+
cis-1,2-Dichloroethene	ug/L	ND	1.0	09/20/11 18:17	
Ethylbenzene	ug/L	ND	1.0	09/20/11 18:17	
Iodomethane	ug/L	ND	10.0	09/20/11 18:17	
Methylene chloride	ug/L	ND	1.0	09/20/11 18:17	
Tetrachloroethene	ug/L	ND	1.0	09/20/11 18:17	
Toluene	ug/L	ND	1.0	09/20/11 18:17	
trans-1,2-Dichloroethene	ug/L	ND	1.0	09/20/11 18:17	
Trichloroethene	ug/L	ND	1.0	09/20/11 18:17	
Vinyl chloride	ug/L	ND	1.0	09/20/11 18:17	
Xylene (Total)	ug/L	ND	3.0	09/20/11 18:17	
1,2-Dichloroethane-d4 (S)	%	102	82-119	09/20/11 18:17	
4-Bromofluorobenzene (S)	%	100	87-113	09/20/11 18:17	
Dibromofluoromethane (S)	%	101	86-112	09/20/11 18:17	
Toluene-d8 (S)	%	99	90-110	09/20/11 18:17	

LABORATORY CONTROL SAMPLE: 878041

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1-Trichloroethane	ug/L	20	20.5	102	82-119	
1,2-Dichloroethane	ug/L	20	19.1	96	77-125	
Acetone	ug/L	100	79.2	79	18-192	
Benzene	ug/L	20	18.2	91	82-117	
Carbon disulfide	ug/L	20	20.9	105	75-138	
Chlorobenzene	ug/L	20	18.0	90	83-121	
Chloroform	ug/L	20	18.7	93	82-116	
cis-1,2-Dichloroethene	ug/L	20	18.7	93	80-119	
Ethylbenzene	ug/L	20	18.9	94	79-121	
Iodomethane	ug/L	20	19.6	98	14-169	
Methylene chloride	ug/L	20	24.0	120	75-118	L0
Tetrachloroethene	ug/L	20	20.5	103	80-124	
Toluene	ug/L	20	17.8	89	80-120	
trans-1,2-Dichloroethene	ug/L	20	25.5	127	79-120	L0
Trichloroethene	ug/L	20	19.4	97	76-122	
Vinyl chloride	ug/L	20	18.8	94	57-163	

### QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

LABORATORY CONTROL SAMPLE: 878041

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Xylene (Total)	ug/L	60	55.1	92	75-120	
1,2-Dichloroethane-d4 (S)	%			100	82-119	
4-Bromofluorobenzene (S)	%			100	87-113	
Dibromofluoromethane (S)	%			100	86-112	
Toluene-d8 (S)	%			98	90-110	

### QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: WET/31040 Analysis Method: SM 2320B  
QC Batch Method: SM 2320B Analysis Description: 2320B Alkalinity  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

METHOD BLANK: 878020 Matrix: Water  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Alkalinity, Total as CaCO <sub>3</sub>	mg/L	ND	20.0	09/20/11 14:26	

LABORATORY CONTROL SAMPLE: 878021

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Alkalinity, Total as CaCO <sub>3</sub>	mg/L	500	477	95	90-110	

SAMPLE DUPLICATE: 878022

Parameter	Units	60105706001 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO <sub>3</sub>	mg/L	1450	1460	1	9	

SAMPLE DUPLICATE: 878023

Parameter	Units	60106022004 Result	Dup Result	RPD	Max RPD	Qualifiers
Alkalinity, Total as CaCO <sub>3</sub>	mg/L	486	483	1	9	

### QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: WET/30916 Analysis Method: SM 2540C  
QC Batch Method: SM 2540C Analysis Description: 2540C Total Dissolved Solids  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

METHOD BLANK: 873993 Matrix: Water  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Dissolved Solids	mg/L	ND	5.0	09/13/11 08:29	

SAMPLE DUPLICATE: 873994

Parameter	Units	60105706002 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	985	995	1	17	

SAMPLE DUPLICATE: 873995

Parameter	Units	60105926005 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Dissolved Solids	mg/L	475	471	1	17	

## QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER

Pace Project No.: 60105706

QC Batch:	WET/30897	Analysis Method:	SM 4500-H+B
QC Batch Method:	SM 4500-H+B	Analysis Description:	4500H+B pH
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005			

SAMPLE DUPLICATE: 873241

Parameter	Units	60105706001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	9.2	9.1	0	5	H6

## QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: WETA/17643 Analysis Method: EPA 300.0  
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

METHOD BLANK: 879888 Matrix: Water

Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND	1.0	09/22/11 14:26	
Sulfate	mg/L	ND	1.0	09/22/11 14:26	

METHOD BLANK: 881492 Matrix: Water

Associated Lab Samples: 60105706001, 60105706004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND	1.0	09/23/11 14:02	
Sulfate	mg/L	ND	1.0	09/23/11 14:02	

LABORATORY CONTROL SAMPLE: 879889

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	5.0	100	90-110	
Sulfate	mg/L	5	5.0	101	90-110	

LABORATORY CONTROL SAMPLE: 881493

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	5	4.9	99	90-110	
Sulfate	mg/L	5	5.0	101	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 878547 878548

Parameter	Units	60105265003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	Max RPD	Qual
Chloride	mg/L	39.3	25	25	65.9	67.7	106	114	64-118	3	12
Sulfate	mg/L	9.5	5	5	14.4	14.4	99	98	61-119	0	10

MATRIX SPIKE SAMPLE: 878549

Parameter	Units	60105358001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	18.0	10	28.8	108	64-118	
Sulfate	mg/L	14.0	10	24.3	103	61-119	

## QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: WETA/17614 Analysis Method: EPA 353.2  
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

METHOD BLANK: 877263 Matrix: Water  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/L	ND	0.10	09/20/11 13:40	
Nitrogen, Nitrite	mg/L	ND	0.10	09/20/11 13:40	
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	09/20/11 13:40	

LABORATORY CONTROL SAMPLE: 877264

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/L	1.6	1.7	105	90-110	
Nitrogen, Nitrite	mg/L	.4	0.44	109	90-110	
Nitrogen, NO2 plus NO3	mg/L	2	2.1	106	90-110	

MATRIX SPIKE SAMPLE: 877265

Parameter	Units	60105611001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/L	29.7	16	45.1	97	90-110	
Nitrogen, Nitrite	mg/L	ND	4	4.0	97	90-110	
Nitrogen, NO2 plus NO3	mg/L	29.8	20	49.1	97	90-110	

MATRIX SPIKE SAMPLE: 877266

Parameter	Units	60106022005 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/L	ND	1.6	1.8	114	90-110	M0
Nitrogen, Nitrite	mg/L	ND	.4	0.40	98	90-110	
Nitrogen, NO2 plus NO3	mg/L	ND	2	2.2	111	90-110	M0

SAMPLE DUPLICATE: 877267

Parameter	Units	60106022006 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	mg/L	ND	ND		15	
Nitrogen, Nitrite	mg/L	ND	ND		31	
Nitrogen, NO2 plus NO3	mg/L	ND	.042J		13	

### QUALITY CONTROL DATA

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

QC Batch: WETA/17594 Analysis Method: SM 5310C  
QC Batch Method: SM 5310C Analysis Description: 5310C Total Organic Carbon  
Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

METHOD BLANK: 875584

Matrix: Water

Associated Lab Samples: 60105706001, 60105706002, 60105706003, 60105706004, 60105706005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Organic Carbon	mg/L	ND	1.0	09/15/11 19:12	

LABORATORY CONTROL SAMPLE: 875585

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Organic Carbon	mg/L	5	5.0	101	80-120	

MATRIX SPIKE SAMPLE: 875587

Parameter	Units	5052539005 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Total Organic Carbon	mg/L	1.1	5	6.1	100	80-120	

SAMPLE DUPLICATE: 875586

Parameter	Units	5052207013 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Organic Carbon	mg/L	6.6	6.8	2	25	

## QUALIFIERS

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

### DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

### LABORATORIES

PASI-K Pace Analytical Services - Kansas City  
PASI-M Pace Analytical Services - Minneapolis

### BATCH QUALIFIERS

Batch: MSV/40140

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

Batch: MSV/40186

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

### ANALYTE QUALIFIERS

1e The sample was analyzed by RSK 175 within the recommended holding time but had QC failures. The reported results were analyzed outside the recommended holding time and confirmed the original analysis.

B+ Analyte was detected in the associated method blank as well as in the sample.

E Analyte concentration exceeded the calibration range. The reported result is estimated.

H6 Analysis initiated more than 15 minutes after sample collection.

L0 Analyte recovery in the laboratory control sample (LCS) was outside QC limits.

L1 Analyte recovery in the laboratory control sample (LCS) was above QC limits. Results for this analyte in associated samples may be biased high.

L3 Analyte recovery in the laboratory control sample (LCS) exceeded QC limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.

M0 Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.

Z3 Methylene chloride is a common laboratory contaminant. Results for this analyte should be considered estimated unless the amount found in the sample is 3 to 5 times higher than that found in the method blank.

### QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60105706001	LPZ-5-090611	RSK 175	AIR/13131		
60105706002	OBW-1-090611	RSK 175	AIR/13131		
60105706003	REC-4-090612	RSK 175	AIR/13131		
60105706004	MW-24A-090611	RSK 175	AIR/13131		
60105706005	MW-24B-090611	RSK 175	AIR/13131		
60105706001	LPZ-5-090611	EPA 3010	MPRP/15279	EPA 6010	ICP/13273
60105706002	OBW-1-090611	EPA 3010	MPRP/15279	EPA 6010	ICP/13273
60105706003	REC-4-090612	EPA 3010	MPRP/15279	EPA 6010	ICP/13273
60105706004	MW-24A-090611	EPA 3010	MPRP/15279	EPA 6010	ICP/13273
60105706005	MW-24B-090611	EPA 3010	MPRP/15279	EPA 6010	ICP/13273
60105706001	LPZ-5-090611	EPA 5030B/8260	MSV/40186		
60105706002	OBW-1-090611	EPA 5030B/8260	MSV/40186		
60105706003	REC-4-090612	EPA 5030B/8260	MSV/40186		
60105706004	MW-24A-090611	EPA 5030B/8260	MSV/40186		
60105706005	MW-24B-090611	EPA 5030B/8260	MSV/40186		
60105706006	TRIP BLANK	EPA 5030B/8260	MSV/40140		
60105706001	LPZ-5-090611	SM 2320B	WET/31040		
60105706002	OBW-1-090611	SM 2320B	WET/31040		
60105706003	REC-4-090612	SM 2320B	WET/31040		
60105706004	MW-24A-090611	SM 2320B	WET/31040		
60105706005	MW-24B-090611	SM 2320B	WET/31040		
60105706001	LPZ-5-090611	SM 2540C	WET/30916		
60105706002	OBW-1-090611	SM 2540C	WET/30916		
60105706003	REC-4-090612	SM 2540C	WET/30916		
60105706004	MW-24A-090611	SM 2540C	WET/30916		
60105706005	MW-24B-090611	SM 2540C	WET/30916		
60105706001	LPZ-5-090611	SM 4500-H+B	WET/30897		
60105706002	OBW-1-090611	SM 4500-H+B	WET/30897		
60105706003	REC-4-090612	SM 4500-H+B	WET/30897		
60105706004	MW-24A-090611	SM 4500-H+B	WET/30897		
60105706005	MW-24B-090611	SM 4500-H+B	WET/30897		
60105706001	LPZ-5-090611	EPA 300.0	WETA/17643		
60105706002	OBW-1-090611	EPA 300.0	WETA/17643		
60105706003	REC-4-090612	EPA 300.0	WETA/17643		
60105706004	MW-24A-090611	EPA 300.0	WETA/17643		
60105706005	MW-24B-090611	EPA 300.0	WETA/17643		
60105706001	LPZ-5-090611	EPA 353.2	WETA/17614		
60105706002	OBW-1-090611	EPA 353.2	WETA/17614		
60105706003	REC-4-090612	EPA 353.2	WETA/17614		
60105706004	MW-24A-090611	EPA 353.2	WETA/17614		
60105706005	MW-24B-090611	EPA 353.2	WETA/17614		
60105706001	LPZ-5-090611	SM 5310C	WETA/17594		
60105706002	OBW-1-090611	SM 5310C	WETA/17594		
60105706003	REC-4-090612	SM 5310C	WETA/17594		

## QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: SOLUTIA GROUNDWATER  
Pace Project No.: 60105706

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60105706004	MW-24A-090611	SM 5310C	WETA/17594		
60105706005	MW-24B-090611	SM 5310C	WETA/17594		
60105706001	LPZ-5-090611	SM 4500-CO2 D	WETA/17645		
60105706002	OBW-1-090611	SM 4500-CO2 D	WETA/17645		
60105706003	REC-4-090612	SM 4500-CO2 D	WETA/17645		
60105706004	MW-24A-090611	SM 4500-CO2 D	WETA/17645		
60105706005	MW-24B-090611	SM 4500-CO2 D	WETA/17645		

# CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

<b>Section A</b> Required Client Information:		<b>Section B</b> Required Project Information:		<b>Section C</b> Invoice Information:	
Company: Environmental Operations, Inc.		Report To: Larry Rosen		Attention:	
Address: 1530 South Second Street, Ste 200		Copy To:		Company Name:	
St. Louis, MO 63104				Address:	
Email To: larryr@environmentalops.com		Purchase Order No.:		Pace Quote Reference:	
Phone: 314-480-4694 Fax: 314-436-2900		Project Name: Solutia Groundwater		Pace Project Manager: Jamie Slade	
Requested Due Date/TAT:		Project Number:		Pace Profile #:	
				<b>REGULATORY AGENCY</b>	
				<input type="checkbox"/> NPDES <input checked="" type="checkbox"/> GROUND WATER <input type="checkbox"/> DRINKING WATER <input type="checkbox"/> UST <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER	
				Site Location: MO STATE: MO	

ITEM #	Section D Required Client Information		Valid Matrix Codes MATRIX CODE		MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED				SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives										Analysis Test ↓	Requested Analysis Filtered (Y/N)															Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	SAMPLE ID (A-Z, 0-9 / -) Sample IDs MUST BE UNIQUE		DRINKING WATER WATER WASTE WATER PRODUCT SOIL/SOLID OIL WIPE AIR OTHER TISSUE	DW WT WW PW SL OL WP AR OT TS			COMPOSITE START		COMPOSITE END/GRAB				Unpreserved	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	HCl	NaOH	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	Methanol	Other	8260 VOCs	Methane/Ethane/Ethene		Alkalinity	Carbon Dioxide	Nitrate	Sulfate	TDS	TOC	1,1,1-trichloroethane	Total Iron	Total Mn																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	John L. E. I.	9/18/11	6:15	Phung Vang	9/17/11	15:12				
	Phung Vang	9/17/11	17:00		9-8-11	08:10	2.1	Y	Y	Y
							3.4	Y	Y	Y

SAMPLER NAME AND SIGNATURE		Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER: Phung Vang					
SIGNATURE of SAMPLER: [Signature]					
DATE Signed (MM/DD/YY): 9/7/11					



### Sample Condition Upon Receipt

Client Name: Environmental Operation Project # 60105706

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☒ Other VFA

Tracking #: \_\_\_\_\_ Pace Shipping Label Used? ☐ Yes ☒ No

Custody Seal on Cooler/Box Present: ☒ Yes ☐ No Seals intact: ☒ Yes ☐ No

Packing Material: ☐ Bubble Wrap ☒ Bubble Bags ☒ Foam ☐ None ☒ Other ZAC

Thermometer Used: T-191 / T-194

Type of Ice: Wet Blue None ☐ Samples on ice, cooling process has begun

Cooler Temperature: 2.1 / 3.4

Temperature should be above freezing to 6°C

Comments:

Date and Initials of person examining contents: pu 9-8-11

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody filled out:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler name & signature on COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Short Hold Time analyses (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	6. <u>NO<sup>2</sup></u>
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	7.
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.
Unpreserved 5035A soils frozen w/in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Filtered volume received for dissolved tests	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	12.
Sample labels match COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	13.
-Includes date/time/ID/analyses Matrix:	<u>WT</u>	
All containers needing preservation have been checked.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	14.
All containers needing preservation are found to be in compliance with EPA recommendation.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Exceptions: <u>VOA</u> coliform, TOC, O&G, WI-DRO (water), Phenolics	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Initial when completed _____ Lot # of added preservative _____
Trip Blank present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	15.
Pace Trip Blank lot # (if purchased): <u>071111-3</u>		
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	16.
Project sampled in USDA Regulated Area:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	17. List State: _____ <u>pu</u>

Client Notification/ Resolution: \_\_\_\_\_ Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: 8470

\_\_\_\_\_ Per Larry Rosen two sample ID corrections, OPW to OBW and REC-1 to REC-4. 9/27/11 JLS.

Project Manager Review: \_\_\_\_\_

Date: 9/9/11

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

## **Appendix H**

### **Administrative Order on Consent**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII

901 N. 5<sup>TH</sup> STREET

KANSAS CITY, KANSAS 66101

IN THE MATTER OF:

J. F. Queeny Facility

St. Louis, Missouri

EPA ID#: MOD004954111

SWH Investments II ("Buyer"), and

Environmental Operations, Inc.

("Guarantor of Interim Measures")

RESPONDENTS

Proceeding under Section 7003

Resource Conservation and Recovery Act,

as amended, 42 U.S.C. § 6973

EPA Docket No: RCRA-07-2009-0015

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ATTACHMENT 1: MAP OF FACILITY

ATTACHMENT 2: APPROVED INTERIM MEASURES WORKPLAN

ATTACHMENT 3: STATEMENT OF WORK

ATTACHMENT 4: DRAFT COVENANT

## ADMINISTRATIVE ORDER ON CONSENT

### I. INTRODUCTION

1. The Administrator of the United States Environmental Protection Agency ("EPA") is issuing this Administrative Order on Consent ("Consent Order") to SWH Investments II ("SWH" or "Buyer") and Environmental Operations, Inc. ("EOI"), hereinafter referred to as the "Respondents," under Section 7003 of the Solid Waste Disposal Act, commonly referred to as the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. § 6973. The Administrator has delegated the authority to issue Orders under Section 7003 of RCRA to the Director, Air and Waste Management Division, U.S. EPA Region 7.
2. This Consent Order is entered into voluntarily by EPA and SWH and EOI. This Consent Order addresses the former Monsanto/Solutia J.F. Queeny facility in St. Louis, Missouri ("Facility"), and provides for the performance of Interim Measures and a Final Remedy, when selected by EPA, as described in Section VIII (Work to be Performed), including any Additional Work that may be required by Section IX (Additional Work) of this Consent Order.
3. In entering into this Consent Order, the mutual objectives of EPA and Respondents are to identify, investigate, remedy, and/or prevent the potential endangerment to human health and/or the environment from activities involving releases of "solid waste" and "hazardous waste," and/or hazardous constituents of such wastes. Respondents shall finance and perform the work required to meet these objectives, in accordance with the plans, standards, specifications and schedules set forth in this Consent Order, or developed pursuant to this Consent Order.
4. EPA has notified the State of Missouri, Department of Natural Resources (MDNR) of this action pursuant to Section 7003(a) of RCRA.

### II. JURISDICTION

5. This Consent Order is issued pursuant to the authority vested in the Administrator of the United States Environmental Protection Agency ("EPA"), under Section 7003 of the Solid Waste Disposal Act, commonly referred to as the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. § 6973. The Administrator has delegated the authority to issue Orders under Section 7003 of RCRA to the Director, Air and Waste Management Division, U.S. EPA Region 7.
6. Respondents agree to undertake and complete all actions required by the terms and conditions of this Consent Order. In any action taken by EPA or the United States to enforce the terms of this AOC, Respondents consent to and agree not to contest the authority or jurisdiction of the EPA to issue or enforce this Consent Order, and agree not to contest the validity of this Consent Order.

7. EPA and Respondents acknowledge that this Consent Order has been negotiated by the parties in good faith and that this Consent Order is fair, reasonable, and in the public interest.

### **III. PARTIES BOUND**

8. This Consent Order applies to and binds EPA, and the Respondents, their agents, successors, assigns, trustees, receivers, and all persons acting on behalf of the Respondents, including but not limited to contractors and consultants. The Respondents shall be responsible for and liable for any violations of this Consent Order, regardless of the use of employees, agents, contractors, or consultants to perform work required by this Consent Order.

9. No change in ownership or corporate or partnership status relating to the Facility shall alter Respondents' obligations under this Consent Order. Any conveyance of title, easement, or other interest in the Facility, or a portion of the Facility, shall not affect the Respondents' obligations under this Consent Order. Respondents shall provide a copy of this Consent Order to any subsequent owners or successors before a controlling interest in ownership rights, stock, assets or the Site is transferred. Respondents shall be responsible for and liable for completing all of the activities required pursuant to this Consent Order, regardless of whether there has been a transfer of ownership or control of the Site or whether said activities are to be performed by employees, agents, contractors, subcontractors, laboratories, or consultants of Respondents. Respondents shall provide a copy of this Consent Order within seven (7) days of the Effective Date of this Consent Order, or the date that such services are retained, to all contractors, subcontractors, laboratories, and consultants that are retained to conduct or monitor any portion of the Work performed pursuant to this Consent Order. Respondents shall condition all contracts or agreements with contractors, subcontractors, laboratories and/or consultants in connection with this Consent Order, on compliance with the terms of this Consent Order. Respondents shall ensure that its contractors, subcontractors, laboratories, and consultants comply with this Consent Order.

10. Not later than sixty (60) days prior to any voluntary transfer by Respondents of any interest in the Site or the operation of the facility, Respondents shall notify EPA of the proposed transfer. In the case of a voluntary transfer through a bankruptcy, Respondents shall notify EPA within 24 hours of the decision to transfer property. Respondents shall notify EPA of any involuntary transfers immediately upon Respondents' initial receipt of notice of any involuntary transfer. Not later than three (3) days after any transfer, Respondents shall submit copies of the transfer documents to EPA.

11. Respondents shall give written notice of this Consent Order and the land use restrictions required under this Consent Order to any successor-in-interest prior to transferring ownership or operation of the Facility, or any portion thereof, and shall notify EPA in writing at least thirty (30) days prior to such transfer. This written notice shall describe how the Respondents have assured that, despite such a transfer, all remedial actions and/or institutional controls required for the Facility by this Consent Order will be implemented and maintained for the Facility.

#### IV. DEFINITIONS

12. Unless otherwise expressly provided herein, terms used in this Consent Order, which are defined in RCRA or in regulations promulgated under RCRA, shall have the meaning assigned to them in RCRA or in such regulations. Whenever terms listed below are used in this Consent Order or in any documents attached hereto and incorporated hereunder, the following definitions apply:

- a. "Corrective Measures Study" or "CMS" shall mean the investigation and evaluation of potential remedies which will protect human health and/or the environment from the release or potential release of hazardous wastes and/or hazardous constituents into the environment from the Facility.
- b. "Day" shall mean a calendar day unless expressly stated to be a business day. Business day shall mean a day other than Saturday, Sunday, or federal holiday. In computing any period of time under this Consent Order, where the last day would fall on a Saturday, Sunday or federal holiday, the period shall run until the close of business of the next business day.
- c. "EPA" shall mean the United States Environmental Protection Agency and any successor department or agencies of the United States.
- d. "Facility" shall mean the property owned and operated by SWH Investments II and Environmental Operations Inc., formerly known as the Monsanto J.F. Queeny Facility, in St. Louis Missouri. A map depicting the location of the Facility, and the legal description of the Facility are set forth in Attachment 1.
- e. "Final Corrective Action Remedy" shall mean the final remedy for the Facility selected by EPA after public notice and comment.
- f. "Interim Measures" or "IM" shall mean those corrective actions described in Attachment 2 to address releases of hazardous wastes and/or constituents at and/or from the Facility which can be initiated in advance of implementation of the final corrective action remedy selected by EPA for the Facility.
- g. "MDNR" shall mean the Missouri Department of Natural Resources.
- h. "Consent Order" shall mean this Administrative Order on Consent and all attachments hereto. In the event of a conflict between this Consent Order and any provision of any other agreement, or writing, the terms and conditions of this Consent Order shall control.
- i. "Paragraph" shall mean a portion of this Consent Order identified by an arabic numeral.
- j. "Parties" shall mean the EPA and the Respondents.
- k. "RCRA" shall mean the Resource Conservation and Recovery Act, as amended, 42 U.S.C. § 6901, et seq.
- l. "RCRA Facility Investigation" or "RFI" shall mean the investigation and characterization of the source(s) of contamination and the nature, extent, direction, rate, movement and concentration of the source(s) of contamination and releases of hazardous waste, including hazardous constituents, that have been or are likely to be released into the environment from the Facility.
- m. "Respondents" shall mean, jointly and/or severally, SWH Investments II ("Buyer"), and Environmental Operations, Inc., incorporated on March 1984, and

their individual agents, successors, receivers, trustees and assigns.

- n. "Section" shall mean a portion of this Consent Order identified by a roman numeral.
- o. "Solid Waste Management Unit" or "SWMU" shall mean any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released. The definition includes regulated units (i.e., landfills, surface impoundments, waste piles and land treatment units).

## **V. FINDINGS OF FACT**

13. The Facility encompasses approximately 38 acres of land in an area zoned for commercial and industrial use. The Facility is bordered by commercial/industrial property to the north, south and west, and a rail yard and the Mississippi River border the site to the east. A legal description and map of the Facility is set forth in Attachment 1.

14. The Facility began operation in 1901, and has manufactured more than 200 products, using more than 800 raw materials. The Facility ceased production operations in 2006. Products previously manufactured at the Facility include, but are not limited to:

- process chemicals such as maleic anhydride,
- fumaric acid,
- toluene sulfonic acid,
- paranitrophenetole;
- plasticizers such as phthalate esters and toluene sulfonamides;
- synthetic functional fluids such as Pydrauls™, Skydrols™, and coolanols;
- food and fine chemicals such as salicylic acid, aspirin, methyl salicylate, benzoic acid, and ethavan; and
- pesticide and herbicide chemicals (such as Lasso™)

15. The Facility is currently subject to a RCRA permit issued to Monsanto on November 8, 1989 (Permit No. MOD004954111), jointly by EPA and the Missouri Department of Natural Resources (MDNR), pursuant Section 3004(u) and (v) of RCRA, 42 U.S.C. 6944(u) and (v), and Missouri Hazardous Waste Management Law and implementing regulations. The term of the 1989 RCRA permit expired November 8, 1999, but has been administratively continued, pursuant to 40 C.F.R. 270.51.

16. The MDNR portion of the 1989 RCRA permit applies to the RCRA obligations required for the treatment, storage/and or disposal of hazardous wastes. The Facility was permitted for container storage, tank storage and incineration. The activities authorized by the state portion of the RCRA permit were the operation and maintenance of hazardous waste treatment (incinerator) and storage (tank and container) units. The permitted Hazardous Waste Management Units (HWMUs) were certified by MDNR as closed and have no further regulatory obligations for post-closure care.

17. The EPA portion of the 1989 RCRA permit sets forth what are known as "corrective action" obligations that are required to address both on- and off-site releases of RCRA regulated hazardous and solid wastes. The corrective action portion of the permit requires a RCRA facility investigation ("RFI") and a study of cleanup alternatives or "corrective actions" called a Corrective Measures Study ("CMS").

18. Effective September 1, 1997, Monsanto transferred its chemical businesses to Solutia, Inc. (Solutia). Under the agreement between the two parties, the Facility was transferred to, and has since been owned and operated by Solutia. Pursuant to this agreement, Solutia agreed to assume, and indemnify Monsanto for, certain liabilities related to its chemical businesses, including the Facility.

19. Monsanto, and/or its successor, Solutia, previously conducted investigations of the Facility as required by the 1989 Permit, and that are summarized in a RCRA Facility Investigation Report dated July 2002.

20. On June 30, 2006, Solutia submitted an "Updated 2005 Risk Assessment and Conceptual Risk Management Plan" ("Risk Assessment", or "RA") to EPA which presents the conceptual risk management plan and media cleanup objectives for the four Solid Waste Management Units (SWMUs) at the site which pose either a current or future unacceptable risk to human health and the environment. The Updated Risk Assessment and Conceptual Risk Management Plan was approved by EPA on February 28, 2007.

21. The RFI and RA process evaluated all known SWMUs at the Facility and EPA has determined that four SWMU's are carried forward in the evaluation process for Interim Measures. As summarized below, releases of solid wastes, hazardous wastes and/or hazardous constituents from four SWMUs at the Facility were determined by the updated Risk Assessment to pose potential risks to human health (under an industrial use scenario) and/or environmental receptors. Under such an industrial use scenario and risk assessment, the following four SWMUs have been determined to require further corrective action:

a. Former FF Building: The Former FF Building includes a footprint of the former building and the surrounding area including the location of a former underground storage tank (UST). The Former FF Building was a production area used for the manufacture of trichlorocarbanilide (TCC), a bacteriostat used in soap. Production of TCC began at the Facility in 1951 and in early 1991 the operations ceased and the production area was dismantled. The UST formerly stored tetrachloroethene (PCE) which was used in the production of TCC. In 1987 a release of PCE occurred from the UST which has since been removed. Monsanto installed and operated four recovery wells to mitigate the release. PCE and its degradation products trichloroethene (TCE), cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride have all been detected in groundwater in this area in excess of EPA's Maximum Contaminant Levels (MCLs). Free product, both Dense Non-Aqueous Phase Liquids (DNAPL) and Light Non-Aqueous Phase Liquids (LNAPL) have been found in monitoring wells in the area. The LNAPL is comprised primarily of toluene. Chlorobenzene has also been detected in groundwater in the Former FF Building area at concentrations greater than MCLs.

b. VV Building: The VV Building is an existing structure that was formerly used for the unloading, bulk storage and repackaging of products including Pydrauls™, Skydrols™ which contained polychlorinated biphenyls (PCBs). In 1993 approximately 40 cubic yards of PCB-contaminated soil was removed and disposed by the Facility at a Toxic Substances Control Act (TSCA) approved landfill. In 2004 approximately 150 cubic yards of PCB-contaminated soils were removed by the Facility and disposed at a TSCA approved landfill. Subsequent sampling found that PCBs greater than 100 parts per million (ppm) remain in subsurface soils in the VV Building area.

c. Former Acetanilides Production Area: The Former Acetanilides Production Area produced Acetanilides, or alachlor, which was sold under the product name of Lasso™. Production in the area began in 1966 and ceased in 1991. Alachlor and chlorobenzene were released to subsurface soils and groundwater beneath the Former Acetanilides Production Area. Concentrations of these constituents exceed the EPA's MCL standards for groundwater.

d. Former Bulk Chemical Storage Area: The Former Bulk Chemical Storage Area is a 1.94 acre parcel of land to the southeast which is not contiguous with the rest of the Facility. It was purchased in 1968 from Clark Oil Company and included two 500,000 gallon above ground storage tanks (ASTs) and two 300,000 gallon ASTs that were used by Clark for fuel storage. Monsanto used these ASTs until 1987 to store petroleum products, alkyl benzenes, blends of alkyl benzenes, Santitizer 154, plasticizer (p-tert-butylphenyl diphenyl phosphate), monochlorobenzene, o-nitrochlorobenzene, sodium hydroxide, and potassium hydroxide. Based on previous investigations, LNAPL comprised primarily of chlorobenzene, benzene, and ethyl benzene has been detected in groundwater in the Former Bulk Chemical Storage Area. Constituents detected in groundwater in excess of EPA's MCLs include: chlorobenzene, benzene, ethyl benzene, cis-1,2-dichloroethene and vinyl chloride. These constituents have also been detected in soils in the area at levels above risk based exposure levels.

22. On May 4, 2007, Solutia submitted a Corrective Measures Study (CMS) Report to EPA and MDNR.

23. In a letter dated April 9, 2008, Solutia informed EPA of the sale of the Facility to Respondent SWH. Respondent SWH's plans for the Facility included clearing remaining structures for purposes of light commercial and/or industrial development.

24. On May 29, 2008, Respondents SWH and EOI provided EPA with a Letter of Intent to purchase the Facility and negotiate this Consent Order in good faith to complete the remedial obligations at the Facility, to provide financial assurance to ensure the completion of the work to be performed and to effect the necessary institution controls needed to restrict the use of the property in the future to prevent unacceptable exposures to human health and the environment.

25. In a letter dated June 6, 2008, EPA and the Missouri Department of Natural Resources (MDNR) Hazardous Waste Program (HWP) provided comment on the Corrective Measures

Study (CMS) Report prepared by Solutia. The comments from EPA concluded that four SWMUs required corrective measures, and the corrective measures are addressed in the Interim Measures Work Plan (IMWP) prepared by the Respondents as described in Section VIII (Paragraph 36) of this Consent Order. The CMS Report has not yet been approved by EPA and/or MDNR.

26. After assuming ownership and/or operation of the Facility, Respondents have proceeded with demolition of remaining structures on the property. In September 2008, Respondents submitted the IMWP that detailed remediation tasks required to allow the Facility to be redeveloped for light industrial and commercial use. This plan was updated in December 2008 and approved by EPA on February 17, 2009 (See, Attachment 2) and, in addition to other remedial work, contained conditional PCB cleanup standards of 100 ppm conditionally approved, subject to completion of a public notice and comment period. EPA's public notice for the proposed PCB cleanup standards commenced on May 11, 2009 and concluded on June 9, 2009, without comment received from the public, and the proposed standards are now approved as an element of the IMWP.

27. The constituents of concern released at, or from, the Facility include substances that pose known and/or potential adverse human and environmental health effects, and include but are not limited to; tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene, trans-1,2-dichloroethene, vinyl chloride, chlorobenzene, and alachlor. The potential health and/or environmental threat of the solid and/or hazardous wastes and/or hazardous constituents that may have been released from the Facility (including constituents detected above Preliminary Remediation Goals and/or MCLs), is documented in EPA's administrative record for this Consent Order and may also be found in EPA's Integrated Risk Information System (IRIS) and the Agency for Toxic Substances and Disease Registry (ASTDR) found at the following internet sites: [www.epa.gov/iris/index.html](http://www.epa.gov/iris/index.html) and [www.atsdr.cdc.gov/toxfaq.html](http://www.atsdr.cdc.gov/toxfaq.html)

28. The main exposure pathways of concern for the solid wastes and/or hazardous wastes and/or constituents managed and/or released at the Facility are soil and groundwater. Specifically, persons or organisms exposed to soils and dust and/or using contaminated groundwater (by ingestion or dermal contact) may be adversely impacted by the release of solid wastes, hazardous wastes and/or constituents released at, or from, the Facility.

## **VI. CONCLUSIONS OF LAW AND DETERMINATIONS**

29. Based on the Findings of Fact set forth above, and EPA's administrative record supporting this Consent Order, EPA has determined that:

a. Respondent SHW is currently the owner of the Facility. Respondent EOI is a guarantor and operator of the Facility for the completion of interim measures work at the Facility. Respondents SWH and EOI are each a "person" as defined in Section 1004(15) of RCRA, 42 U.S.C. § 6903(15).

b. The materials released into the environment at the Facility include discarded materials, and thus are "solid wastes" as defined in Section 1004(27) of RCRA, 42

U.S.C. § 6903(27). Certain wastes and constituents managed and released at the Facility are also hazardous wastes and/or hazardous constituents pursuant to Section 1004(5) and 3001 of RCRA and 40 C.F.R. Part 261.

c. There is, or has been, a release of solid waste, hazardous wastes and/or hazardous constituents into the environment at, or from, the Facility.

e. Respondents have contributed and/or are contributing to the handling, storage, treatment, transportation, and/or disposal of solid or hazardous wastes as a necessary part of their ownership and/or operation of the Facility, and/or their efforts to redevelop and/or remediate the Facility

f. The past and/or present "handling," "storage," "treatment," "transportation," and/or "disposal" of solid wastes or hazardous wastes containing hazardous constituents at the Facility may present an imminent and substantial endangerment to human health and/or the environment within the meaning of Section 7003(a) of RCRA, 42 U.S.C. § 6973(a).

g. The actions required by this Consent Order are necessary to protect "human health" and/or "the environment," due to the presence of contaminated soils and groundwater at levels which may pose risks to human and environmental receptors.

## **VII. PROJECT MANAGERS**

30. EPA's Project Manager is:

Ms. Stephanie Doolan  
RCRA Corrective Action Program Branch  
Region 7, USEPA  
901 N. 5<sup>th</sup> St.  
Kansas City, Kansas 66101

As of the effective date of this Consent Order, EOI/SWH's Project Manager is:

Eric Page  
Environmental Operations, Inc.  
1530 South Second Street  
Suite 200  
St. Louis, Missouri 63104

31. Each parties' Project Manager will be responsible for overseeing the implementation of this Project. The parties shall provide written notice at least five (5) days prior to a change of their respective designated Project Managers.

32. EPA will approve/disapprove of SWH's replacement Project Manager based upon the person's qualifications and ability to effectively perform this role. The qualifications of the persons undertaking the Work for SWH shall be subject to EPA's review, for verification that

such persons meet minimum technical background and experience requirements of the EPA. All persons under the direction and supervision of Respondents' Project Manager must possess all necessary professional licenses required by federal and state law.

### **VIII. WORK TO BE PERFORMED**

Pursuant to Section 7003 of RCRA, 42 U.S.C. 6973, Respondents hereby agree, and are hereby Ordered, to perform the following actions, in the manner and by the dates specified.

33. All sampling and data collection activities shall be conducted in accordance with the EPA approved Quality Assurance Project Plan (QAPP) approved by EPA on December 1, 2008, and any EPA approved subsequent addenda or updates to the QAPP.

34. The Respondents shall perform the work undertaken pursuant to this Consent Order and in compliance with RCRA and other applicable federal and state laws and their implementing regulations, and consistent with all relevant EPA guidance. Relevant guidance may include, but is not limited to, the "RCRA Corrective Action Plan: Final" (EPA 520-R-94-004, OSWER Directive 9902.3-2a, May 1994), "Interim Final RCRA Facility Investigation (RFI) Guidance" (EPA 530/SW-89-031), "RCRA Ground-water Monitoring: Draft Technical Guidance" (November 1992), "Test Methods for Evaluating Solid Waste" (SW-846, most recent method) and "Construction Quality Assurance for Hazardous Waste Land Disposal Facilities" (EPA 530/SW-85-031, July 1986). These and other potentially applicable guidance may be obtained at <http://www.epa.gov/rcraonline/>.

35. Immediately upon approval or modification by EPA of any Workplan(s) or Report(s), Respondents shall commence work and implement the tasks required by the Workplan(s) or Report(s) submitted pursuant to the Statement(s) of Work contained in Attachment 3 and in accordance with the standards, specifications and schedules stated in the Workplan(s) or Reports, as approved and/or modified by EPA.

#### **Performance of Interim Measures**

36. Based on the RFI and the RA and, subject to the discovery of new information, the parties have designed Interim Measures to perform interim source removals and/or interim treatment at the Facility before selection of the final corrective action by EPA. Respondents shall conduct Interim Measures at the Facility in accordance with the schedule and requirements of the approved Interim Measures Work Plan (IMWP) which is incorporated into and enforceable as an element of this Consent Order (Attachment 2). Pursuant to Section 7003(c) of RCRA during the performance of the required Interim Measures and until approval of the Interim Measures Completion Report, Respondents shall post notices at the Facility that work is being performed pursuant to this Consent Order. In summary and pertinent part, the approved Interim Measures Work Plan requires Respondents to perform, at a minimum, the following tasks:

- a. The excavation and proper disposal of all PCB contaminated soils exceeding levels of 100 ppm PCB in the area of the former VV Building. This shall include disposal

sampling, verification sampling and backfill to surface grade using clean materials.

b. Based on verification sampling, after excavation of soils exceeding 100 ppm, and fill of excavated areas, Respondents shall delineate all areas in former VV Building area which have PCBs remaining at concentrations greater than 10 ppm, and shall install of a cap over these areas (constructed in accordance with the approved Interim Measures Workplan);

c. The installation of an adequate number of monitoring wells in the former VV Building area to demonstrate that PCB contamination in soils has not migrated to groundwater (two minimum);

d. The installation of multiple temporary injection wells at the former FF Building, Former Bulk Chemical Storage Area (FBCSA) and Acetanilides Production Area;

e. The injection of oxidation reagents into the temporary injection wells described above for the purpose of chemically destroying source material in the capillary fringe and upper saturation zone to enhance the long-term biodegradation of VOCs. The IMWP proposes three injection events. Both before and after injection of such reagents, sampling from the temporary wells shall be performed to determine the VOC concentrations in groundwater (Note: The approved IMWP states the remediation goal of this technology is to remove 75% of the remaining mass of total VOCs in subsurface soils that contribute to groundwater contamination. The groundwater treatment is expected to enhance the bioremediation of contaminants in groundwater and accelerate achieving groundwater cleanup objectives).

37. Within ninety (90) days following completion of the work required by the approved Interim Measures Work Plan, Respondents shall submit to EPA an Interim Measures Completion Report for review and approval. The Interim Measures Completion Report shall include a summary of all field activities conducted, and shall state any deviations from the approved IMWP, problems encountered, a written summary of all sampling data collected during implementation of the IMWP; and a compact disc copy of all data report forms, copies of all manifests and bills of lading along with the location(s) of the disposal facilities where solid and hazardous waste was transported and disposed, photographic documentation of the Interim Measures; and final drawings or figures depicting the limits of the excavation, sample locations and monitoring or injection well locations. Based on the performance of the interim measures, the Interim Measures Completion Report shall also discuss whether ongoing notice and/or signage is required to notify persons of potential exposure to hazardous waste and/or constituents.

38. EPA will provide Respondents written comment on the approved Interim Measures Completion Report and will identify data gaps or additional information and/or analysis determined by EPA to be necessary to compare final corrective action alternatives, and select the final corrective action remedy for the Facility.

#### **Facility Monitoring Plan**

39. Within sixty days of the effective date of this Consent Order, Respondent shall submit a Baseline Groundwater Monitoring ("BGM") Plan to EPA for review and approval. The Baseline Groundwater Monitoring Plan shall, at a minimum, propose and describe the following:

- a. a sampling program to determine the effectiveness of the injection of oxidation agents to remediate groundwater contamination;
- b. the activities, procedures, and applicable standards for performance of ground water monitoring to detect and evaluate the baseline conditions for groundwater and thereby establish the remaining level of groundwater contamination beneath the entire Facility and within the Interim Measures areas after completion of the required Interim Measures; and
- c. the Baseline Groundwater Monitoring Plan will propose the basis for establishment of the number and location of monitoring wells to be sampled, analytical parameters, field measurements, and frequency of monitoring and reporting necessary for development of the Long Term Monitoring (LTM) Plan, that will be provided by the Respondents, if required as an element of the final corrective action selected by EPA.

40. When approved by EPA, the BGM shall be used to enforce monitoring requirements during the interim period before the final remedial measures for the Facility are selected by EPA. The goal of the parties is to allow the BGM to be incorporated into any final corrective action or monitoring that may be required as part of the final corrective action selected by EPA.

#### **Focused Corrective Measures Study (CMS)**

41. The results achieved by Respondents' performance of Interim Measures can be considered and incorporated into the Respondent's study of alternatives and recommendation for the final remedy in a Corrective Measures Study (CMS). Within sixty days of receipt of EPA's comments on the Interim Measures Completion Report, Respondents shall submit a focused Corrective Measure Study (CMS) to EPA for review and approval that addresses such comments and that is prepared in accordance with Task I of the Statement of Work in Attachment 3 and conditions requiring action that may remain after the completion of the work required by the approved IMWP. Within the proposed Focused CMS, Respondents shall propose the final corrective action remedy for the Facility, a justification of why the proposed corrective action actions are protective of human health and the environment, and proposed criteria for EPA to determine when the proposed corrective action shall be considered complete. EPA may approve the CMS without prejudice to EPA's rights and authority to select a different final corrective action remedy for the Facility.

#### **Public Participation and Comment on EPA's Corrective Measures Selection**

42. EPA will provide Respondents and the public an opportunity to review and comment on a description of EPA's proposed final corrective action remedy for the Facility, including EPA's justification for proposing such corrective actions (the "Statement of Basis").

43. EPA will notify Respondents of the final corrective action selected by EPA in a Final

Decision Document and Response to comments. The notification will include a statement of EPA's reasons for selecting the corrective measure. In the event that the use restrictions set forth in the attached Restrictive Covenant are changed (Attachment 4), within sixty (60) days after a written request by EPA, Respondents shall submit to EPA for review and approval a focused risk assessment and CMS that addresses potential exposures associated with the change in property use. Any changes in the final corrective action remedy for the Facility shall be made and selected by EPA after preparation of a revised statement of basis and appropriate public notice and comment. Respondents shall implement the changes to the final corrective action remedy in accordance with the schedule set by EPA.

### **Corrective Measures Implementation (CMI)**

44. Within sixty (60) days of Respondents' receipt of notification of EPA's selection of the final corrective action(s) for the Facility, Respondents shall submit to EPA for its review and approval a Corrective Measures Implementation Work plan ("CMI Workplan"). The CMI Workplan shall be developed in accordance with Task IV of the Statement of Work in Attachment 3. The CMI Workplan shall specify the design, construction, operation, maintenance, monitoring and completion criteria of the corrective measures selected by EPA. EPA will review and approve or modify this submittal in accordance with Section IX of this Consent Order (Submissions/Agency Approval/Additional Work).

45. Concurrent with the submission of a CMI Workplan, Respondents shall submit to EPA a CMI Health and Safety Plan, Operation and Maintenance Plan, and a Community Relations Plan, completed in a manner in accordance with Task IV of the Statement of Work in Attachment 3. EPA will review, comment on, approve and/or modify these submittals in accordance with Section IX of this Consent Order.

46. Upon EPA's approval of Respondents' CMI Workplan, Respondents shall implement the selected corrective measure(s) for the Facility in accordance with the EPA-approved CMI Workplan and Task II of the Statement of Work in Attachment 3. Respondents shall furnish all personnel, material, and service necessary for, or incidental to, performing the CMI at the Facility.

47. Within thirty (30) days after the completion of the implementation/construction activities required by the approved CMI Workplan, Respondents shall submit a Corrective Measures Implementation Report prepared in accordance with Task II of the Statement of Work in Attachment 3.

48. When Respondents believe that they have satisfied the EPA approved completion criteria, Respondent shall submit to EPA and MDNR a Corrective Measures Completion Report, for EPA's review and approval, in accordance with Section IX of this Consent Order, that documents how the corrective action objectives and corrective measure completion criteria have been satisfied, and that justifies why the corrective measure and/or monitoring may cease.

## **IX. SUBMISSIONS/AGENCY APPROVAL/ADDITIONAL WORK**

49. Beginning with the month following the effective date of this Consent Order through completion of the final Corrective Measure selected by EPA, or such other time as may be agreed by the parties, Respondents shall submit to EPA bi-monthly (every other month) progress reports, which shall be submitted for each month on or before the tenth day of the month following the reporting period. Thereafter, the bi-monthly progress reports shall report on the performance of the requirements of the Statement of Work contained in Attachment 3. These bi-monthly reports may be submitted by electronic mail (with a hard copy to follow by regular mail) and shall, at a minimum, contain the following information for the previous reporting period:

- a. By project, a description of the work conducted pursuant to this Consent Order during the reporting period and an estimate of the percentage of the project completed;
- b. A description of all projects scheduled for completion during the reporting period which were not completed along with a statement indicating why such projects were not completed and an anticipated completion date;
- c. Copies of all data and sampling and test results and all other laboratory deliverables received by Respondent during the reporting period; and
- d. A description of the projects and actions which are scheduled for the following reporting period.

50. Respondents shall provide the Interim Measures deliverables, Corrective Measures Study and Reports, and Corrective Measure Implementation Workplan to EPA in accordance with the schedule contained in this Consent Order and its attachments. All submittals, Reports, Studies and/or Workplans that are approved by EPA shall be deemed incorporated into and enforceable as a part of this Consent Order.

51. EPA will review all draft or final reports, workplans and submittals, and notify Respondents in writing of EPA's approval, disapproval or modification of the report, workplan, submittal, or any part thereof (excluding monthly progress reports). Within thirty (30) days of receipt of EPA's comments pertaining to any submittal, Respondent shall amend such submittal, addressing all of EPA's comments, and resubmit same to EPA. If Respondent fails to address EPA's comments in a resubmittal, EPA may consider this a failure to submit. If EPA disapproves the revised submittal, it may modify and approve the same in accordance with its comments. In the event of such modification, EPA will notify Respondents of the modification. Upon receipt of EPA's approval or notice of modification, Respondents shall commence work and implement any approved Workplan and/or submittal (e.g., or financial assurance instruments) in accordance with the schedule and provisions contained therein. EPA approved Reports, Studies, Workplans and/or submittals shall be deemed incorporated into and part of this Consent Order.

52. All documents required for submittal to EPA (including Workplan(s), Studies, preliminary and final reports, progress reports, and other correspondence to be submitted pursuant to this Consent Order) shall be hand delivered or sent by certified mail, return receipt requested, to the Project Manager designated pursuant to Section VII (Project Managers) of this

Consent Order.

53. When new information indicates that additional work is necessary to accomplish the purposes of this Consent Order, EPA may determine that certain tasks, including, but not limited to, investigatory work or engineering evaluation, are necessary in addition to the tasks and deliverables included in the Statement of Work set forth in Attachment 3. EPA will provide written notification of the additional work to be performed by Respondents and EPA will specify the basis and reasons for its determination that the additional work is necessary. Within fifteen (15) days after the receipt of such notification, Respondents may request a meeting with EPA to discuss the additional work. Thereafter, Respondents shall perform the additional work according to an EPA-approved workplan. All additional work performed by Respondents shall be performed in accordance with this Consent Order.

54. Additionally, if EPA determines, at its sole discretion, that releases of hazardous substances, hazardous wastes and/or hazardous constituents at or from the Facility pose a potential imminent and substantial endangerment, EPA reserves the right to commence an additional enforcement action pursuant to Section 7003 of RCRA, 42 U.S.C. 6973, and/or Section 106 of CERCLA, 42 U.S.C. 9606, or any other available legal authorities, to protect human health or the environment.

#### **X. FINANCIAL ASSURANCE**

55. Within sixty (60) days of the effective date of this Consent Order, Respondents shall establish and thereafter maintain cash financial assurance for completion of the work required by the IMWP, and estimate costs for the final corrective remedy, as follows:

- a. \$2,100,000 for the performance of work required pursuant to the approved IMWP; and
- b. \$500,000 to be reserved for the performance of final RCRA corrective action, when selected by EPA.

This cash financial assurance shall be in conformance with the financial assurance mechanisms described within 40 C.F.R. §§ 265.142, 265.143, 265.144, and 265.145., but shall explicitly state the purpose of the financial assurance is to insure the work required under this Consent Order. This financial assurance may not include the "financial test" or the "corporate guarantee" (the "cash financial assurance"). This financial assurance may also not initially include a trust agreement, unless fully funded and the form of the trust agreement has been approved by EPA (See Paragraph 56, below)

56. Within thirty (30) days of the effective date of this Consent Order, Respondents shall submit a standby Trust Agreement to EPA for review and approval. Upon EPA approval of the form of a Trust Agreement, Respondents may thereafter choose to utilize a fully funded trust for the financial assurance obligations of Paragraphs 55, 57-59, if the Trust is fully funded for these costs at creation.

57. Financial assurance for the performance of work required pursuant to the approved IMWP, as required by Paragraph 55.a, shall be maintained for the Facility until such time as

Respondents are notified in writing by EPA that all such work required by the approved IMWP is complete with respect to the Facility.

58. Upon written notice to Respondents from EPA, the amount of "cash financial assurance" required pursuant to Paragraph 55.a shall be reduced on a quarterly basis to an amount equal to the money expended on work performed by Respondents pursuant to the approved IMWP (and any amendments thereto) during the previous calendar quarter pursuant to the approved IMWP (January-March, April-June, July-September, October-December). By January 30 of each calendar, Respondents shall provide EPA a written estimate for the cost of performance of any remaining requirements of the IMWP, until EPA's approval of the Interim Measures Completion Report. In the event that EPA determines that the estimated costs of completion of the work required by the approved IMWP is greater than the remaining balance of cash financial assurance pursuant to Paragraph 55.a, within thirty (30) days of receipt of notice from EPA, Respondents shall establish additional cash financial assurance equal to the difference of the remaining balance maintained pursuant to Paragraphs 55.a and the amount necessary to complete the work required by the IMWP. Conversely, in the event EPA determines that the estimated cost of completion of the work required by the approved IMWP is less than the remaining balance of financial assurance pursuant to paragraph 55.a, EPA shall reduce the amount of financial assurance to that amount. At any time, at EPA's sole discretion, EPA may also approve Respondent's request for a reduction in the amount of financial assurance required pursuant to Paragraph 55.a based on the completion of tasks identified in the IMWP (Attachment II) or work for a specific SWMUs.

59. The amount and form of financial assurance for the performance of final RCRA corrective action at the Facility, as required by Paragraph 55.b, shall be maintained until such time as financial assurance equal to the amount required for performance of the final RCRA corrective action selected by EPA for the Facility has been established pursuant to this Order on Consent, or until EPA determines in writing that no further RCRA corrective action at the Facility is necessary. In the event that EPA determines the estimated cost of completion of the RCRA corrective action at the Facility is greater than the amount held in trust pursuant to Paragraph 55.b, Respondents shall contribute additional cash financial assurance equal to the difference between the remaining balance maintained pursuant to Paragraph 55.b and amount determined by EPA as the cost estimate of the final corrective action remedy. At EPA's discretion, EPA may approve that Respondents may establish other forms of financial assurance for this difference, in conformance with the financial assurance mechanisms described within 40 C.F.R. §§ 265.142, 265.143, 265.144, and 265.145.

60. Respondents are liable for the work required by this Consent Order, and the financial assurance under the provisions of this Section; however, the financial assurances for performance of the IMWP and final corrective action as required by Paragraph 55 to 59 may be established and maintained by a third party, if approved in advance by EPA. If approved by EPA, such third party financial assurances shall satisfy Respondents' financial assurance obligations pursuant to Paragraphs 55 to 59. In the event that this occurs, EPA will notify Respondents upon receipt of a document from or on behalf of such third party that financial assurance in an amount and manner sufficient to satisfy the terms of this Section has been established.

61. Respondents shall also adjust the amount held in trust pursuant to Paragraphs 55 and 56 if EPA determines that any additional Work is required, pursuant to Section IX (Additional Work), or if any other condition increases the cost of the Work to be Performed under this Consent Order. Concurrent with the approval of any additional Workplan(s) required under Section VIII (Work To Be Performed), including any work required as Additional Work under this Consent Order and/or Corrective Measures Implementation Workplan (CMI), Respondents shall submit to EPA a revised detailed written estimate(s), in current dollars, of the cost of hiring a third party to perform such Work. By January 30<sup>th</sup> of each calendar year, Respondents shall provide an annual inflation adjustment of the amount held in trust EPA for the required work based on the prior calendar year's national consumer price index. EPA will review, approve and/or modify and approve each revised estimate pursuant to Section IX of this Consent Order. EPA will notify Respondents in writing of EPA's approval, disapproval, or modification of the revised cost estimate(s), and upon EPA approval, Respondents shall adjust the amount held in trust consistent with EPA's approval.

## **XI. STIPULATED PENALTIES**

62. If Respondents fail to comply with any requirement of this Consent Order in a timely and satisfactory manner, Respondents shall pay stipulated penalties as set forth below:

a. For failure to submit to EPA any submittal (except the progress reports called for in Section VIII (Work to be Performed) required by this Consent Order, including the Statement of Work in Attachment 3:

i. \$1,000.00 per day for the first through thirty-first day and each succeeding day of noncompliance thereafter.

b. For failure to use best efforts to obtain off-site access agreements and/or to submit a progress report required by Section VIII (Work to be Performed) of this Consent Order:

i. \$300.00 per day for the first through fourteenth days of noncompliance; and

ii. \$600.00 per day for the fifteenth day and each succeeding day of noncompliance thereafter..

c. For failure to complete the work specified in any Workplan submitted pursuant to Section VIII (Work to be Performed) or required by Section IX (Submissions/Agency Approval/Additional Work) of this Consent Order:

i. \$750.00 per day for the first through seventh days of noncompliance;

ii. \$1,500.00 per day for the eighth through thirtieth days of noncompliance; and,

iii. \$2,250.00 per day for the thirty-first day and each succeeding day of noncompliance thereafter.

63. All penalties shall begin to accrue on the first business day after complete performance is

due or a violation occurs, and shall continue to accrue through the final day of correction of the noncompliance. Separate penalties may simultaneously accrue under this Consent Order for separate violations of this Consent Order.

64. All penalties owed to EPA pursuant to this Section shall be due and payable within thirty (30) days of Respondents' receipt of a written notification of the assessment thereof, unless Respondents invoke the dispute resolution under Section XIV (Dispute Resolution). Such notification will describe the noncompliance and will indicate the amount of the penalties due. Interest shall begin to accrue on the unpaid balance beginning on the thirty-first (31<sup>st</sup>) day after Respondents receives notification of the assessment of stipulated penalties. Interest shall accrue at the annual rate established by the Secretary of the Treasury pursuant to 31 U.S.C. § 3717. The interest will be assessed on the overdue amount from the due date through the date of payment.

65. All penalties shall be paid by certified or cashier's check made payable to "Treasurer of the United States" and shall be remitted to the United States Environmental Protection Agency, Fines and Penalties, Cincinnati Finance Center, PO Box 979077, St. Louis, MO, 63197-9000. All payments shall reference the name of the Facility, Respondent(s) name, and the EPA docket number of this Consent Order. A copy of the transmittal of payment shall be sent simultaneously to the EPA Project Manager. Respondents may dispute EPA's assessment of stipulated penalties by invoking the dispute resolution procedures under Section XIV (Dispute Resolution). The stipulated penalties in dispute shall continue to accrue, but payment need not be paid, during the dispute resolution period. Respondents shall pay any disputed stipulated penalties and interest, if any, in accordance with the dispute resolution decision and/or agreement. Respondents shall submit such payment within seven (7) days of receipt of such decision and/or agreement.

66. The stipulated penalties set forth in this Section do not preclude EPA from pursuing any other remedy or sanction which may be available to EPA by reason of Respondents' failure to comply with any of the requirements of this Consent Order, nor shall payment of said penalties relieve Respondents of the responsibility to comply with this Consent Order.

## **XII. ACCESS AND INSTITUTIONAL CONTROLS**

67. If the Facility, or any other property where access or institutional controls are needed to implement this Consent Order, is owned or controlled by Respondents, Respondents shall:

- a. Commencing on the effective date of this Consent Order, provide the EPA, MDNR, and their representatives and contractors, with access at all reasonable times to the Facility or such other property, for the purpose of conducting any activity related to this Consent Order including, but not limited to, the following activities:
  - i. Monitoring the required Work;
  - ii. Verifying any data or information submitted to EPA or MDNR;
  - iii. Conducting investigations relating to contamination at or near the Facility;
  - iv. Obtaining samples;
  - v. Assessing the need for, planning, or implementing additional

- response actions at or near the Facility;
- vi. Assessing implementation of quality assurance and quality control practices as defined in the EPA-approved QAPP;
  - vii. Implementing the Work required pursuant to the Consent Order;
  - viii. Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Respondent or their agents;
  - ix. Assessing Respondents' compliance with this Consent Order;
  - x. Determining whether the Facility or other property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted, by or pursuant to this Consent Order; and
  - xi. Implementing, monitoring, or enforcing any institutional controls.
- b. Commencing on the effective date of this Consent Order, refrain from using the Facility, or such other property, in any manner that would interfere with or adversely affect the implementation, integrity, or protectiveness of the corrective actions to be performed pursuant to this Consent Order; and
- c. Execute and record in the Recorder's Office of St. Louis County, State of Missouri, a Restrictive Covenant prepared in conformance with the Environmental Covenant attached as Attachment 4 to this Consent Order, that (i) grants a right of access for the purpose of conducting any activity related to this Consent Decree including, but not limited to, those activities listed in Paragraph 67(a) of this Section, and (ii) grants the right to enforce the land/water use restrictions that EPA determines are necessary to implement, ensure non-interference with, or ensure the protectiveness of the interim measures, additional work or final corrective action(s) to be performed pursuant to this Order. Respondents shall grant the access rights and the rights to enforce the land/water use restrictions to (i) EPA, and its representatives, (ii) MDNR and its representatives, (iii) each individual Respondent and their representatives, and/or (iv) other appropriate grantees.
- d. Respondents shall, within forty five (45) days of the effective date of this Order, submit to EPA for review and approval, with respect to the Facility:
- i. A draft covenant or other appropriate instrument, in substantially the form set forth in Environmental Covenant attached as Attachment 4, that is enforceable under the laws of the State of Missouri, and that will prohibit the use of groundwater at the Facility and restrict future use of the Facility to non-residential uses (commercial and industrial); and
  - ii. A current title insurance commitment or some other evidence of title acceptable to EPA, which shows title to the land described in the covenant/instrument to be free and clear of all prior liens and encumbrances (except when those liens or encumbrances are approved by EPA or when, despite best efforts, Respondents are unable to obtain release or subordination of such prior liens or encumbrances).
- e. Within fifteen (15) days of EPA's approval and acceptance of the

covenant/instrument and the title evidence, Respondents shall update the title search and, if it is determined that nothing has occurred to affect the title adversely since the effective date of the commitment, record the Covenant/instrument with the Recorder's Office of St. Louis County, Missouri.

- f. Within thirty (30) days of recording the covenant/instrument, the Respondents shall provide EPA with a final title insurance policy, or other final evidence of title acceptable to EPA, and a certified copy of the original recorded covenant/instrument showing the clerk's recording stamps.

68. If the Facility, or any other property where access and/or land/water use restrictions are needed to implement this Consent Decree, is owned or controlled by persons other than any of the Respondents, Respondents shall use best efforts to secure from such persons:

- a. An agreement to provide access for Respondents, as well as for EPA and MDNR, and their representatives and contractors, for the purpose of conducting any activity related to this Consent Order including, but not limited to, those activities listed in Paragraph 67(a) of this Section.
- b. An agreement, enforceable by Respondents and EPA, to refrain from using the Facility, or such other property, in any manner that would interfere with or adversely affect the implementation, integrity, or protectiveness of the corrective actions to be performed pursuant to this Consent Order; and
- c. The execution and recordation in the Recorder's Office of St. Louis County, Missouri, of an Environmental Covenant in conformance with the example Covenant set forth as Attachment 4 to this Consent Order, that (i) grants a right of access for the purpose of conducting any activity related to this Consent Order including, but not limited to, those activities listed in Paragraph 67(a) of this Section, and (ii) grants the right to enforce the land/water use restrictions listed in Paragraph 67(a) of this Section, or other restrictions that EPA determines are necessary to implement, ensure non-interference with, or ensure the protectiveness of the corrective actions to be performed pursuant to Consent Order. The access rights and/or rights to enforce land/water use restrictions shall be granted to EPA and MDNR and their representatives; (iii) Respondents and their representatives; and/or (iv) other appropriate grantees.
- d. Within forty-five (45) days of entry of this Order, Respondents shall submit to EPA for review and approval with respect to such property:
  - i. A draft covenant or other appropriate instrument, in substantially the form set forth in Attachment 4, that is enforceable under the laws of the State of Missouri, and
  - ii. A current title insurance commitment or some other evidence of title acceptable to EPA, which shows title to the land described in the covenant/instrument to be free and clear of all prior liens and encumbrances (except when those liens or encumbrances are approved by

EPA or when, despite best efforts, Respondents are unable to obtain release or subordination of such prior liens or encumbrances).

- e. Within fifteen (15) days of EPA's approval and acceptance of the covenant/instrument and the title evidence, Respondents shall update the title search and, if it is determined that nothing has occurred to affect the title adversely since the effective date of the commitment, the covenant/instrument shall be recorded with the Recorder's Office of St. Louis County, Missouri.
- f. Within thirty (30) days of the recording of the covenant/instrument, Settling Defendants shall provide EPA with a final title insurance policy, or other final evidence of title acceptable to EPA, and a certified copy of the original recorded covenant/instrument showing the clerk's recording stamps.

69. For purposes of Section XII (Access and Institutional Controls), Paragraphs 67 and 68, of this Consent Order, "best efforts" shall include the payment of reasonable sums of money in consideration of access, access agreements, land/water use restrictions, and/or an agreement to release or subordinate a prior lien or encumbrance.

70. Within forty-five (45) days of Respondents' receipt of EPA's Final Decision and Response to Comments that establishes EPA's selected final corrective action remedy for the Facility, Respondents shall modify the covenants required by Paragraphs 65 and 66 as appropriate for the final remedy.

71. If (a) any access or land/water use restrictions required by Paragraphs 67 and 68 are not obtained within forty-five (45) days of the effective date of this Consent Order, (b) or any access or land/water use restrictions required by this Section are not submitted to EPA in draft form within forty-five (45) days of the effective date of this Consent Order, or (c) Respondents are unable to obtain an agreement pursuant to this Section, from the holder of a prior lien or encumbrance to release or subordinate such lien or encumbrance to the land/water use restrictions being created pursuant to this Consent Decree within forty-five (45) days of the effective date of this Consent Order, Respondents shall promptly notify EPA's Project Manager in writing, and shall include in that notification a summary of the steps that Respondents have taken to attempt to comply with this Section.

72. EPA may, as it deems appropriate, assist Respondents in obtaining access or land/water use restrictions, either in the form of contractual agreements or in the form of land/water use restrictions running with the land, or in obtaining the release or subordination of a prior lien or encumbrance.

73. If EPA determines that land/water use restrictions in the form of state or local laws, regulations, ordinances or other governmental controls are needed to implement an approved interim measure, additional work, or final corrective action remedy selected for the Facility, or to ensure the integrity and protectiveness of such actions, or to ensure non-interference with such actions, Respondents shall cooperate with EPA's and/or MDNR's efforts to secure such governmental controls.

74. Notwithstanding any provision of this Consent Order, EPA and MDNR retain all of their access authorities and rights, as well as all of their rights to require land/water use restrictions, including enforcement authorities related thereto, under CERCLA, RCRA, and any other applicable statute or regulations.

### **XIII. RECORD PRESERVATION**

75. Respondents shall retain, during the pendency of this Consent Order and for at least six (6) years after the Consent Order terminates, all data and all final documents now in their possession or control or which come into their possession or control, which relate to the subject of this Consent Order. Respondents shall notify EPA in writing ninety (90) days before destroying any such records, and give EPA the opportunity to take possession of any non-privileged documents. The Respondents' notice will refer to the effective date, caption, and docket number of this Consent Order and will be addressed EPA's Project Manager and:

Director  
Air and Waste Management Division  
U.S. EPA, Region 7  
901 N. 5th Street  
Kansas City, KS 66101

76. Respondents shall not assert any claim of privilege concerning any data gathered during any investigations or other actions required by this Consent Order.

### **XIV. DISPUTE RESOLUTION**

77. The parties will use their best efforts to confer informally to resolve all disputes or differences of opinion regarding the obligations of this Consent Order.

78. If any party disagrees, in whole or in part, with a decision made or action taken regarding an enforceable requirement of this Consent Order, that party will notify the other party's Project Manager of the disagreement. The Project Managers will attempt to informally resolve the identified dispute. If the Project Managers cannot resolve the dispute informally, either party may pursue the matter formally by placing its objections in writing. A written objection must state the specific points in dispute, the basis for that party's position, and any matters which it considers necessary for determination.

79. The parties will in good faith attempt to resolve the dispute through formal negotiations within twenty-one (21) days, or a longer period if agreed in writing by the parties. If the parties are unable to reach an agreement through formal negotiations, within fourteen (14) business days after any formal negotiations end, the parties may submit additional written information to the Director of the Air and Waste Management Division, U.S. EPA Region 7. EPA will maintain a record of the dispute, which will contain all statements of position and any other documentation submitted pursuant to this Section.

80. Based on the record, EPA will respond to the Respondents' arguments and evidence and provide a detailed written decision on the dispute that is signed by the Director of the Air and Waste Management Division, U.S. EPA Region 7 ("EPA Dispute Decision"). No EPA decision made pursuant to this Section shall constitute a final agency action giving rise to judicial review prior to a judicial action brought by the United States to enforce the decision. In any such judicial action, Respondents shall have the burden of demonstrating that the decision of the EPA official is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled for the dispute.

#### **XV. FORCE MAJEURE AND EXCUSABLE DELAY**

81. Force majeure, for purposes of this Consent Order, is any event arising from causes not foreseen and beyond the Respondents' control that delay or prevent the timely performance of any obligation under this Consent Order, despite the Respondents' best efforts.

82. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Order, whether or not caused by a force majeure event, the Respondents must notify EPA within two business days after learning that the event may cause a delay. If the Respondents wish to claim a force majeure event, within 15 business days thereafter the Respondents must provide to EPA in writing all relevant information relating to the claim, including a proposed revised schedule.

83. If EPA determines that a delay or anticipated delay is attributable to a force majeure event, EPA will extend in writing the time to perform the obligation affected by the force majeure event for such time as EPA determines is necessary to complete the obligation.

#### **XVI. MODIFICATION**

84. This Consent Order may be modified only by mutual agreement of EPA and the Respondents. Any agreed modifications will be in writing, will be signed by all the parties, will be effective on the date of signature by EPA, and will be incorporated into this Consent Order.

#### **XVII. RESERVATION OF RIGHTS**

85. Notwithstanding any other provisions of this Consent Order, EPA and the United States retain all of its authority to take, direct, or order any and all actions necessary to protect public health or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants, or contaminants, or hazardous or solid waste or constituents of such wastes, on, at, or from the Site, including but not limited to the right to bring enforcement actions under RCRA, CERCLA, and any other applicable statutes or regulations.

86. EPA reserves all of its statutory and regulatory powers, authorities, rights, and remedies, both legal and equitable, which may pertain to Respondents' failure to comply with any of the requirements of this Consent Order, including without limitation the assessment of penalties under Section 7003 of RCRA, 42 U.S.C. § 6973.

87. Except as stated expressly herein, this Consent Order shall not be construed as a covenant not to sue, release, waiver, or limitation of any rights, remedies, powers, claims, and/or authorities, civil or criminal, which EPA has under RCRA, CERCLA, or any other statutory, regulatory, or common law authority of the United States.

88. This Consent Order is not intended to be nor shall it be construed to be a permit. Respondent acknowledges and agrees that EPA's approval of the Work and/or Work Plan does not constitute a warranty or representation that the Work and/or Work Plans will achieve the required cleanup or performance standards. Compliance by Respondent with the terms of this Consent Order shall not relieve Respondent of its obligations to comply with RCRA or any other applicable local, state, or federal laws and regulations.

89. Notwithstanding any other provision of this Consent Order, no action or decision by EPA pursuant to this Consent Order, including without limitation, decisions of the Regional Administrator, the Director of Region 7's Air and Waste Management Division, or any authorized representative of EPA, shall constitute final agency action giving rise to any right of judicial review prior to EPA's initiation of a judicial action to enforce this Consent Order, including an action for penalties or an action to compel Respondent's compliance with the terms and conditions of this Consent Order.

#### **XVIII. OTHER CLAIMS**

90. Respondents waive any claims or demands for compensation or payment under Sections 106(b), 111, and 112 of CERCLA against the United States or the Hazardous Substance Superfund established by 26 U.S.C. § § 9507 for, or arising out of, any activity performed or expense incurred under this Consent Order. Additionally, this Consent Order is not a decision on preauthorization of funds under Section 111(a)(2) of CERCLA.

#### **XIX. INDEMNIFICATION OF THE UNITED STATES GOVERNMENT**

91. The Respondents indemnify, save and hold harmless the United States, its agencies, departments, agents, and employees, from all claims or causes of action arising from or on account of acts or omissions of the Respondents or its officers, employees, agents, independent contractors, receivers, trustees, and assigns in carrying out activities required by this Consent Order. This indemnification will not affect or limit the rights or obligations of the Respondents or the United States under their various contracts. This indemnification will not create any obligation on the part of the Respondents to indemnify the United States from claims arising from the acts or omissions of the United States.

#### **XX. INSURANCE**

92. Prior to commencing the on-site Work under this Consent Order, Respondents shall secure, and shall maintain in force for the duration of the Consent Order and for two (2) years after completion of all activities required by this Consent Order, comprehensive general liability insurance and automobile insurance with limits of one million dollars, combined single limit, naming EPA as an additional insured. Prior to commencement of the Work under this Consent

Order, and annually thereafter on the anniversary of the Effective Date of this Consent Order, Respondents shall provide EPA with certificates of insurance and a copy of each insurance policy. If Respondents demonstrate by evidence satisfactory to EPA that its contractors and subcontractors maintain insurance equivalent to that described above, or insurance covering some or all of the same risks but in an equal or lesser amount, the Respondents need provide only that portion of the insurance described above which is not maintained by the contractors and subcontractors.

93. For the duration of this Consent Order, Respondents shall satisfy, or shall ensure that their contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of employer's liability insurance and worker's compensation insurance for all persons performing work on behalf of Respondents, in furtherance of this Consent Order. At least seven (7) days prior to commencing the Work under this Consent Order, Respondents shall certify to EPA that their contractors and subcontractors have obtained the required insurance.

#### **XXI. SEVERABILITY**

94. If any judicial or administrative authority holds any provision of this Consent Order to be invalid, the remaining provisions will remain in force and will not be affected.

#### **XXII. TERMINATION AND SATISFACTION**

95. Respondents may request that EPA issue a determination that the Respondents have met the requirements of the Consent Order for all or a portion of the Facility. Respondents may also request that EPA issue a "corrective action complete" determination for all, or a portion of, the Facility.

96. The Respondents sent will affirm their continuing obligation to preserve all records as required by Section XIII, to maintain any necessary institutional controls or other long term measures, and to recognize EPA's reservation of rights as required in Section XVII.

#### **XXIII. COVENANT NOT TO SUE**

97. In consideration of the actions that will be performed by Respondents under the terms of this Consent Order, and except as otherwise specifically provided in this Agreement, as authorized by Section 7003(d) of RCRA and subject to public notice and comment, the EPA covenants not take administrative action against Respondents pursuant to Sections 3008(h), 3013, and 7003 of RCRA for response costs and work at the facility to address known conditions at the facility as described in the Findings of Fact of this Consent Order and existing on the effective date of this Consent Order. This covenant not to take administrative action shall take effect upon the Effective Date and is conditioned upon the complete and satisfactory performance by Respondents of all obligations under this Consent Order. This extends only to Respondents and does not extend to any other person.

98. The covenant not to sue set forth in Section XXIII above does not pertain to any matters other than those expressly identified therein. The EPA reserves, and this Consent Order is

without prejudice to, all rights against Respondents with respect to all other matters, including, but not limited to:

- a. claims based on a failure by Respondents to meet a requirement of this Consent Order;
- b. criminal liability;
- c. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;
- d. liability resulting from a new release or threat of release of hazardous substances, pollutants or contaminants at or in connection with the Facility after the Effective Date;
- e. liability arising from the disposal, release or threat of release of waste materials outside of the Facility.

#### **XXIV. PUBLIC COMMENT ON THIS CONSENT ORDER**

99. EPA shall provide public notice, opportunity for a public meeting and a reasonable opportunity for public comment on the proposed settlement. After consideration of any comments submitted during a public comment period of not less than 30 days (which EPA may extend), EPA may withhold consent or seek to amend all or part of this AOC if EPA determines that comments received disclose facts or considerations which indicate that this AOC is inappropriate, improper, or inadequate.

#### **XXIV. EFFECTIVE DATE**

100. This Consent Order shall be effective upon written notice to Respondents after completion of the public comment period as specified in Section XXIV (PUBLIC COMMENT) above.

#### **FOR RESPONDENTS::**

DATE: SEP 30 2009

BY: [Original signed by Stacie Hastie]  
Stacie Hastie  
SWH Investments II  
Respondent

DATE: SEP 30 2009

BY: [Original signed by Mathew D. Robinson]  
Matt Robinson  
Environmental Operations, Inc.  
Respondent

FOR THE REGION 7, UNITED STATES ENVIRONMENTAL PROTECTION  
AGENCY

DATE: 9/30/09

BY: [Original signed by H. Bunch]  
Howard C. Bunch  
Sr. Assistant Regional Counsel  
U.S. Environmental Protection Agency  
Region 7

IT BEING SO AGREED, IT IS HEREBY ORDERED:

DATE: 9/30/09

BY: [Original signed by John J. Smith for]  
Becky Weber, Director  
Air and Waste Management Division  
U.S. Environmental Protection Agency  
Region 7

# CERTIFICATE OF SERVICE

I hereby certify that the Original of above document was filed with the Regional Hearing Clerk, Region 7, USEPA, and copies were transmitted to the listed parties by the means noted, on this date, September 30, 2009.

9/30/09

[Original signature illegible]

Date:

**By Federal Express**

Eric Page  
Environmental Operations, Inc.  
1530 South Second Street  
Suite 200  
St. Louis, Missouri 63104

**By Email (w/o attachments):**

George M. von Stamwitz  
Armstrong Teasdale LLP  
1 Metropolitan Sq. Suite 2600  
St. Louis, MO 63102



LEGAL DESCRIPTION

EXHIBIT "A"

PARCEL 1:

A TRACT OF LAND BEING PART OF CITY BLOCK 720, TRACT I-IIB OF KOSCIUSKO SUBDIVISION (P.B. 34 PG. 1), PART OF LESPERANCE STREET, 50 FEET WIDE, VACATED BY ORDINANCE NO. 51744, AND PART OF SECOND STREET, 60 FEET WIDE, VACATED BY ORDINANCE NO. 55641, INCLUSIVE OF THOSE STREETS AND ALLEY WAYS VACATED THEREIN, ALL IN THE CITY OF ST. LOUIS, MISSOURI AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE NORTH LINE OF LESPERANCE STREET, 50' WIDE, VACATED BY ORDINANCE NUMBER 51744 WITH THE EASTERN LINE OF THIRD STREET, 60 FEET WIDE; THENCE ALONG NORTH LINE OF LESPERANCE STREET, SOUTH 67° 00' 08" EAST 342.06 FEET TO THE CENTERLINE OF SECOND STREET, 60' WIDE, VACATED BY ORDINANCE NUMBER 55641; THENCE ALONG SAID CENTERLINE SOUTH 38° 50' 39" WEST 10.63 FEET AND SOUTH 22° 51' 00" WEST 379.42 FEET TO THE NORTH LINE OF RUSSELL AVENUE, 50 FEET WIDE; THENCE DEPARTING THE CENTERLINE OF SECOND STREET, ALONG SAID NORTH LINE OF RUSSELL AVENUE NORTH 66° 59' 53" WEST 186.18 FEET TO THE SOUTHEAST CORNER OF TRACT I-IIA OF KOSCIUSKO SUBDIVISION AS PER THE PLAT THEREOF RECORDED IN PLAT BOOK 34 PAGE 1 OF THE ST. LOUIS CITY RECORDS; THENCE WITH THE EAST AND NORTH LINES OF TRACT I-IIA, NORTH 23° 01' 48" EAST 192.42 FEET AND NORTH 67° 03' 03" WEST 156.50 FEET TO THE AFORESAID EAST LINE OF THIRD STREET; THENCE ALONG SAID EAST LINE, NORTH 23° 01' 48" EAST 155.67 FEET TO A POINT OF CURVATURE; THENCE NORTHWARDLY ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 330.00 FEET WITH A DISTANCE OF 43.90 FEET TO THE POINT OF BEGINNING, ACCORDING TO A SURVEY BY THE STERLING COMPANY DURING THE MONTH OF MAY 2008 UNDER ORDER NUMBER 08-03-050.

PARCEL 2:

A TRACT OF LAND BEING A PART OF CITY BLOCK 733 OF THE CITY OF ST. LOUIS, MISSOURI, INCLUSIVE OF THOSE STREETS AND ALLEY WAYS VACATED THEREIN, AND BEING MORE PARTICULARLY DESCRIBED AS:

BEGINNING AT THE INTERSECTION OF THE SOUTH LINE OF SOUTH TRUDEAU STREET, 40 FEET WIDE, WITH THE EAST LINE OF SECOND STREET, 65 FEET WIDE; THENCE ALONG SAID SOUTH LINE OF SOUTH TRUDEAU STREET SOUTH 67° 05' 23" EAST 315.17 FEET TO THE WEST LINE OF DEKALB STREET, 60 FEET WIDE; THENCE ALONG THE WEST LINE OF DEKALB STREET SOUTH 23° 23' 25" WEST 136.26 FEET TO THE CENTERLINE OF A 20 FOOT WIDE ALLEY; THENCE ALONG SAID CENTERLINE OF 20 FOOT WIDE ALLEY NORTH 67° 05' 23" WEST 313.80 FEET TO SAID EAST LINE OF SECOND STREET; THENCE ALONG SAID EAST LINE OF SECOND STREET NORTH 22° 48' 53" EAST 136.26 FEET TO THE POINT OF BEGINNING, ACCORDING TO A SURVEY BY THE STERLING COMPANY DURING THE MONTH OF MAY 2008 UNDER ORDER NUMBER 08-03-050.

PARCEL 3:

A TRACT OF LAND BEING A PART OF LOT 1 OF THE SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706 (P.B. 60 PG. 41), ALL OF CITY BLOCKS 735, AND 6501 AND A PART OF CITY BLOCKS 723, 724 AND 738, INCLUSIVE OF THOSE STREETS AND ALLEY WAYS VACATED THEREIN, ALL IN THE CITY OF ST. LOUIS, MISSOURI AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE CENTERLINE OF RUSSELL (50' WIDE) AVENUE VACATED BY ORDINANCE NUMBER 50258 AND THE SOUTH LINE OF SECOND (60' WIDE) STREET, SAID POINT ALSO BEING ON THE SOUTH LINE OF LOT 1 OF A SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706 AS PER THE PLAT THEREOF RECORDED IN PLAT BOOK 60 PAGE 41 OF THE ST. LOUIS CITY RECORDS; THENCE WITH THE VACATED CENTERLINE OF RUSSELL AVENUE AND THE SOUTH LINE OF SAID LOT 1, SOUTH 66° 56' 57" EAST 716.34 FEET TO THE INTERSECTION OF THE CENTERLINE RUSSELL AVENUE VACATED BY ORDINANCE NUMBER 49861 AND THE CENTERLINE OF KOSCIUSKO (60' WIDE) STREET VACATED BY ORDINANCE NUMBER 50258; THENCE WITH THE CENTERLINE OF VACATED KOSCIUSKO STREET, NORTH 22° 45' 50" EAST 212.09 FEET TO A POINT ON THE SOUTH LINE OF LOT B OF THE SUBDIVISION OF BLOCK 714 AS PER THE PLAT THEREOF RECORDED IN PLAT BOOK 03292005 PAGE 480 OF THE ST. LOUIS CITY RECORDS; THENCE DEPARTING THE VACATED CENTERLINE OF KOSCIUSKO STREET WITH THE SOUTH LINE OF SAID LOT B, SOUTH 67° 30' 32" EAST 1.47 FEET TO A POINT, FROM SAID POINT A FOUND CROSS BEARS NORTH 17° 11' 38" EAST 0.03 FEET; THENCE CONTINUING WITH THE SAID SOUTH LINE, NORTH 23° 33' 59" EAST 160.64 FEET TO A POINT; THENCE NORTH



26°57'33" EAST 30.92 FEET TO A POINT, FROM SAID POINT A FOUND COTTON PICKER SPINDLE BEARS SOUTH 04°37'20" EAST 0.04 FEET; THENCE SOUTH 82°50'37" EAST 19.95 FEET TO A FOUND COTTON PICKER SPINDLE; THENCE SOUTH 71°53'07" EAST 243.53 FEET TO A COTTON PICKER SPINDLE FOUND FOR THE INTERSECTION OF THE SOUTH LINE OF SAID SUBDIVISION OF BLOCK 714 AND THE EAST LINE OF LESPERANCE (100' WIDE) STREET VACATED BY ORDINANCE NUMBER 55123; THENCE DEPARTING THE SOUTH LINE OF SAID SUBDIVISION OF BLOCK 714, WITH THE SAID EAST LINE OF VACATED LESPERANCE STREET, SOUTH 27°28'08" WEST 77.52 FEET TO A POINT ON THE SOUTH LINE OF LESPERANCE STREET; THENCE WITH THE SAID SOUTH LINE, SOUTH 62°31'52" EAST 102.95 FEET TO A POINT OF THE EAST LINE OF CITY BLOCK 732 AND THE WEST LINE OF MISSOURI PACIFIC RAILROAD RIGHT-OF-WAY; THENCE WITH THE WEST RIGHT-OF-WAY LINE, SOUTH 18°52'52" WEST 320.64 FEET TO A POINT ON THE NORTH LINE OF RUSSELL (50' WIDE) AVENUE; THENCE WITH THE NORTH LINE OF SAID RUSSELL AVENUE, NORTH 66°56'57" WEST 37.96 FEET TO THE EAST LINE OF RUSSELL AVENUE VACATED BY ORDINANCE NUMBER 50258; THENCE WITH THE SAID EAST LINE, SOUTH 23°03'03" WEST 50.00 FEET TO A POINT ON THE SOUTH LINE OF SAID RUSSELL AVENUE; THENCE WITH THE SAID SOUTH LINE SOUTH 66°56'57" EAST 41.60 FEET TO THE AFORESAID WEST LINE OF MISSOURI PACIFIC RAILROAD RIGHT-OF-WAY; THENCE WITH THE SAID WEST RIGHT-OF-WAY LINE, SOUTH 18°52'52" WEST 305.91 FEET TO A POINT OF CURVATURE; THENCE ALONG A CURVE TO THE RIGHT WITH A RADIUS OF 680.00 FEET WITH AN ARC LENGTH OF 173.54 FEET TO A POINT OF TANGENCY; THENCE SOUTH 33°30'12" WEST 857.68 FEET TO THE CENTERLINE OF BARTON (66' WIDE) STREET; THENCE WITH THE SAID CENTERLINE OF BARTON STREET AND THE SOUTH LINE OF THAT PART OF BARTON STREET VACATED BY ORDINANCE NO. 57176, NORTH 67°00'08" WEST 218.34 FEET TO A POINT; THENCE NORTH 22° 59' 52" EAST 33.00 FEET ALONG THE WEST LINE OF SAID BARTON STREET VACATION TO THE NORTH LINE OF SAID BARTON STREET; THENCE ALONG SAID NORTH LINE OF BARTON STREET NORTH 67° 00' 08" WEST 400.17 FEET TO THE CENTERLINE OF DEKALB STREET, 60 FEET WIDE, BEING THE SOUTHWEST CORNER OF THAT PART OF DEKALB STREET VACATED BY ORDINANCE NO. 45381; THENCE ALONG SAID CENTERLINE AND THE WEST LINE OF SAID DEKALB STREET VACATION NORTH 23° 08' 39" EAST 162.50 FEET; THENCE SOUTH 67° 00' 05" EAST 185.50 FEET; THENCE NORTH 23° 17' 27" EAST 78.00 FEET; THENCE SOUTH 67° 00' 04" EAST 185.70 FEET TO THE CENTERLINE OF KOSCIUSKO STREET, 60 FEET WIDE, VACATED BY ORDINANCE NO. 57176; THENCE ALONG SAID CENTERLINE NORTH 23° 26' 15" EAST 259.77 FEET; THENCE NORTH 66° 33' 45" WEST 30.00 FEET TO THE WEST LINE OF VACATED KOSCIUSKO STREET; THENCE SOUTH 53° 18' 35" WEST 30.12 FEET TO A POINT OF CURVATURE; THENCE SOUTHWARDLY ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 320.00 FEET A DISTANCE OF 240.07 FEET; THENCE NORTH 67° 00' 02" WEST 113.69 FEET TO THE EAST LINE OF DEKALB STREET, 60 FEET WIDE; THENCE ALONG SAID EAST LINE OF DEKALB STREET NORTH 23° 08' 39" EAST 224.00 FEET; THENCE NORTH 23° 23' 25" EAST 342.70 FEET TO THE EASTWARD EXTENSION OF THE NORTH LINE OF SOUTH TRUDEAU STREET, 40 FEET WIDE; THENCE ALONG SAID EASTWARD EXTENSION AND THE NORTH LINE OF SOUTH TRUDEAU STREET NORTH 67° 05' 23" WEST 375.57 FEET TO THE EAST LINE OF SECOND STREET, 60 FEET WIDE; THENCE ALONG SAID EAST LINE OF SECOND STREET NORTH 22° 48' 53" EAST 418.63 TO THE POINT OF BEGINNING, ACCORDING TO A SURVEY BY THE STERLING COMPANY DURING THE MONTH OF MAY 2008 UNDER ORDER NUMBER 08-03-050.

**PARCEL 4:**

A TRACT OF LAND BEING A PART OF LOT 1 OF A SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706 (P.B. 60 PG. 41) BEING A PART OF CITY BLOCK 714, INCLUSIVE OF THOSE STREETS AND ALLEY WAYS VACATED THEREIN, IN THE CITY OF ST. LOUIS AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE INTERSECTION OF THE CENTERLINE OF SECOND (60' WIDE) STREET, VACATED BY ORDINANCE NO 55641 AND THE NORTH LINE OF RUSSELL (50' WIDE) AVENUE, SAID POINT ALSO BEING THE SOUTHWEST CORNER OF LOT 1 OF A SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706 AS PER THE PLAT THEREOF RECORDED IN PLAT BOOK 60 PAGE 41 OF THE ST. LOUIS CITY RECORDS; THENCE WITH THE VACATED CENTERLINE OF SECOND STREET AND THE WEST LINE OF SAID SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706, NORTH 22°51'00" EAST 379.42 FEET AND NORTH 38°50'39" EAST 2.18 FEET TO A POINT ON THE WESTERN PROLONGATION OF THE SOUTH LINE OF THE SUBDIVISION OF BLOCK 714 AS PER THE PLAT THEREOF RECORDED IN PLAT BOOK 03292005 PAGE 480 OF THE ST. LOUIS CITY RECORDS; THENCE DEPARTING THE VACATED CENTERLINE OF SECOND STREET WITH THE SOUTH LINE OF SAID SUBDIVISION OF BLOCK 714, SOUTH 66°54'54" EAST 394.21 FEET TO A POINT; THENCE SOUTH 23°28'24" WEST 197.61 FEET TO A POINT; THENCE SOUTH 67°30'32" EAST 353.37 FEET TO A POINT IN THE CENTERLINE OF KOSCIUSKO (60' WIDE) STREET VACATED BY ORDINANCE NUMBER 50258, SAID POINT ALSO BEING ON THE EAST LINE OF AFORESAID SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706 (P.B. 60 PG. 41); THENCE WITH THE



CENTERLINE OF VACATED KOSCIUSKO STREET AND THE EAST LINE OF SAID LOT 1, SOUTH 22°45'50" WEST 212.09 FEET TO THE INTERSECTION OF THE CENTERLINE OF VACATED KOSCIUSKO STREET AND THE CENTERLINE OF RUSSELL (50' WIDE) AVENUE VACATED BY ORDINANCE NUMBERS 49861, 47995 AND 50258, SAID POINT ALSO BEING ON THE SOUTHEAST CORNER OF SAID LOT 1 OF THE SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706 (P.B. 60 PG. 41); THENCE WITH THE CENTERLINE OF VACATED RUSSELL AVENUE AND THE SOUTH LINE OF THE SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706, NORTH 66°56'57" WEST 716.34 FEET TO A POINT; THENCE DEPARTING THE VACATED CENTERLINE OF RUSSELL AVENUE, WITH THE SOUTH LINE OF THE SUBDIVISION OF BLOCK 714 AND PART OF BLOCK 706, NORTH 22°48'53" EAST 5.09 FEET TO A POINT; THENCE NORTH 22°51'00" EAST 19.91 FEET TO A POINT; THENCE NORTH 66°59'53" WEST 30.00 FEET TO THE POINT OF BEGINNING, ACCORDING TO A SURVEY BY THE STERLING COMPANY DURING THE MONTH OF MAY 2008 UNDER ORDER NUMBER 08-03-050.

PARCEL 5:

A TRACT OF LAND BEING A PART OF CITY BLOCK 872, IN THE CITY OF ST. LOUIS, MISSOURI AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE EAST LINE OF FIRST (106' WIDE) STREET AND THE NORTH LINE OF VICTOR (60' WIDE) STREET THENCE WITH THE EAST LINE OF SAID FIRST STREET, NORTH 33°06'49" EAST 281.25 FEET TO THE SOUTHWEST CORNER OF A TRACT OF LAND DESCRIBED IN A DEED TO RHINO ENTERPRISES RECORDED ON 07/28/98 WITH A DAILY NUMBER 215; THENCE DEPARTING THE EAST LINE OF FIRST STREET WITH THE SOUTH LINE OF RHINO ENTERPRISES TRACT, SOUTH 52°08'36" EAST 301.44 FEET TO A POINT ON THE WEST LINE OF WHARF AS DESCRIBED IN ORDINANCE NO. 5403; THENCE WITH THE WEST LINE OF SAID WHARF, SOUTH 33°13'02" WEST 268.82 FEET AND SOUTH 37°29'40" WEST 12.35 FEET TO THE NORTH LINE OF AFORESAID VICTOR STREET; THENCE WITH THE SAID NORTH LINE, NORTH 52°08'36" WEST 300.03 FEET TO THE POINT OF BEGINNING, ACCORDING TO A SURVEY BY THE STERLING COMPANY DURING THE MONTH OF MAY 2008 UNDER ORDER NUMBER 08-03-050.

PARCEL 6:

AN APPURTENANT, NON-EXCLUSIVE WATER MAIN EASEMENT ESTABLISHED BY THE EASEMENT AGREEMENT RECORDED IN BOOK 05222006 PAGE 0276.

Countersigned:

*Gloria Lewis*

Authorized Signatory

## ATTACHMENT 2: APPROVED INTERIM MEASURES WORKPLAN

### ATTACHMENT 3: STATEMENT OF WORK

## ATTACHMENT IV:

### INTRODUCTION

1. The purpose of this Scope of Work (SOW) for the former Monsanto/Solutia Queeny Facility in St. Louis, Missouri (Facility) is to define the requirements, standards and guidelines which shall be followed by the Respondents to accomplish the following Tasks:

Task I: If requested by EPA, to prepare a Corrective Measures Study (CMS) that identifies, compares and recommends alternatives to address the contamination at, and/or originating from, Respondent's Facility.

Task II: To perform the Corrective Measures Implementation (CMI) that implements the remedy selected by EPA to prevent, mitigate, and/or remediate any migration or release of solid and/or hazardous wastes and/or hazardous constituents at, and/or from, the Facility.

In accomplishing the above Tasks, the Respondents shall comply with the provisions of the corresponding Administrative Order on Consent (Order) between the United States Environmental Protection Agency (EPA) and Respondents SWH Investments II (SWH) and Environmental Operations, Inc. (EOI) this SOW and all applicable EPA guidance (including, but not limited to, the guidance documents referenced in the Order and this SOW). The Statement of Work and schedule for currently identified work to be performed under the Order is set forth below.

### **TASK I: IDENTIFICATION AND DEVELOPMENT OF THE CORRECTIVE MEASURE ALTERNATIVE OR ALTERNATIVES**

2. Respondents shall conduct a focused Corrective Measures Study (CMS) that shall identify, screen and develop the alternative or alternatives for removal, containment, treatment and/or other remediation of the contamination based on the overall protection of human health and the environment. This focused CMS shall take into account EPA's comments on the Interim Measures Completion Report, and shall address any issues of data gaps or additional alternatives that need to be considered for EPA to be able to select the final remedy for the Facility.

3. The CMS shall identify/develop how alternatives provide human health and environmental protection, attain media cleanup standards based on the ability of alternatives to achieve the media cleanup standards prescribed in the Order. Respondents shall identify/develop how measures control the sources of releases by describing how alternatives reduce or eliminate to the maximum extent possible further releases. Respondents shall identify/develop methods to comply with standards for the management of wastes generated during corrective measures.

4. **Draft CMS Report.** Within sixty (60) days of EPA approval of the Interim Measures Completion Report, Respondents shall submit to EPA for approval a draft CMS Report. The

draft CMS Report shall describe a detailed evaluation of corrective measure alternatives and a recommendation as to the alternative (or alternatives) which should be selected to address contamination originating at SWMUs and/or AOCs at the Facility. The draft CMS report shall address, without limitation, all items set forth in this Task, below:

**a. Statement of purpose:** The draft CMS Report shall describe the purpose of the document and provide a summary description of the project;

**b. Description of Current Conditions:** The draft CMS Report shall include a brief discussion of any new information that has been developed since the Effective Date of the Order, including the performance of the Interim Measures. This discussion shall concentrate on those issues which could significantly affect the evaluation and selection of the corrective measure alternative(s);

**c. Corrective Action Objectives**

The draft CMS Report shall describe and propose Respondents' corrective action objectives. Specifically, Respondents shall propose applicable media cleanup standards for each medium where Facility-related contamination poses an unacceptable risk to human health and the environment. The corrective action objectives shall be based on promulgated federal and state standards, risk-derived standards, and all data and information gathered during the corrective action process (e.g., from interim measures, RCRA Facility Investigation, etc.), and/or other applicable guidance documents. If no specific standards exist for a given contaminant and media, the Respondents shall propose and justify a media cleanup standard for such contaminant and/or media;

**d. Identification, Screening, and Development of Corrective Measure Alternatives**

**(1) Identification of Technologies:**

(a) The draft CMS Report shall list and describe potentially applicable technologies for each affected media that may be used to achieve the corrective action objectives proposed by Respondent. The draft CMS Report shall include a table that summarizes the available technologies;

(b) The draft CMS Report may consider innovative treatment technologies, especially in situations where existing corrective measure technologies are limited. Innovative technologies are defined as those technologies utilized for source control other than incineration, solidification/stabilization, and pumping with conventional treatment for contaminated groundwater. The EPA may require treatability studies and/or on-site pilot scale studies to evaluate the effectiveness of any proposed innovative treatment technologies;

(c) Respondents may conduct, and include in the draft CMS Report, laboratory and/or bench scale studies to determine the applicability of a corrective measure technology or technologies to facility conditions. The methodology of these studies is subject to EPA review and approval;

(d) If Respondents propose laboratory and/or bench scale studies, Respondents shall develop and submit a testing plan to the EPA for review and approval that identifies the type(s) and goal(s) of the study or studies, the level of effort needed, and the procedures to be used for data management and interpretation. Upon completion of the testing, the Respondents shall evaluate the testing results to assess the technology or technologies with respect to the site-specific questions identified in the test plan; and

(e) The draft CMS Report shall summarize the testing program and its results (if studies are performed), both positive and negative.

(2) Screening of Technologies:

(a) The draft CMS Report shall present a screening of corrective measures technologies to demonstrate why certain corrective measures technologies may not prove feasible to implement given the existing set of waste and site-specific conditions; and

(b) If only one corrective measure alternative is being analyzed, the draft CMS Report shall indicate any technological limitations given waste- and site-specific conditions at the Facility for which it is being considered. Respondents shall present these findings in tabular form.

(3) Corrective Measure Development:

(a) The draft CMS Report shall assemble the technologies that pass the screening step into specific alternatives that have the potential to meet the corrective action objectives for each media; and

(b) Each alternative proposed in the draft CMS Report shall consist of an individual technology or a combination of technologies used in sequence (i.e., a treatment train). Different alternatives may be considered for separate areas of the Facility. The developed alternatives shall be carried forward for evaluation using the EPA's four General Standards for Remedies and Remedy Selection Decision Factors.

## 5. General Standards for Remedies

For each remedy which warrants a more detailed evaluation, the draft CMS Report shall provide detailed documentation of how the potential remedy will comply with each of the General Standards for Remedies listed below. These standards reflect the major technical components of remedies including cleanup of releases, source control and management of wastes that are generated by remedial activities. Specifically these standards are:

- a. Be protective of human health and the environment;
- b. Attain media cleanup standards set by the EPA;
- c. Control the source(s) of releases so as to reduce or eliminate, to the extent practicable, further releases that may pose a threat to human health and the environment; and
- d. Comply with any applicable standards for management of wastes.

6. Any corrective measure alternative proposed by Respondents in the draft CMS Report must satisfy the four General Standards for Remedies in order to be carried forward for evaluation using the Remedy Selection Decision Factors. In evaluating the selected corrective measure alternative or alternatives, the Respondents shall prepare and submit information that documents that the specific remedy will meet the standards listed above. A detailed explanation of the General Standards for Remedies is set forth below.

**7. Any proposed Remedy must be Protective of Human Health and the Environment**

The standard for protection of human health and the environment is a general mandate of the RCRA statute. This standard requires that remedies include those measures that are needed to be protective, but are not directly related to media cleanup, source control, or management of wastes. The draft CMS Report shall include a discussion on what types of short term remedies are appropriate for the Facility in order to meet this standard. This information must be provided in addition to a discussion of how the other corrective measure alternatives meet this standard.

**8. Any proposed remedy must attain Media Cleanup Standards Set by the EPA**

Remedies will be required to attain media cleanup standards which are set by EPA (based on state or federal regulations (e.g., groundwater standards) or other standards which are set by the EPA). Certain technical aspects of the remedy, such as the practical capabilities of remedial technologies, may influence to some degree the media cleanup standards that are established. The draft CMS Report shall address whether the potential remedy will achieve the preliminary remediation objective as identified by the EPA as well as other alternative corrective action objectives that may be proposed by the Respondent. Respondents shall also include an estimate of the time frame necessary for each alternative to meet these standards.

**9. Any proposed remedy must Control the Sources of Releases**

A critical objective of any remedy proposed by Respondents must be to stop further environmental degradation by controlling or eliminating further releases that may pose a threat to human health and the environment. An effective source control program is essential to ensure the long-term effectiveness and protectiveness of the corrective action program. As part of the draft CMS Report, the Respondents shall address the issue of whether source control measures are necessary, and if so, the type of source control actions that would be appropriate. Any source control measure proposed shall include a discussion on how well the method is anticipated to work given the particular situation at the Facility and the known track record of the specific technology.

**10. Any proposed remedy must comply With Any Applicable Standards for Management of Wastes.**

The draft CMS Report shall include a discussion of how the specific waste management activities will be conducted in compliance with all applicable state or federal regulations (e.g., the land disposal restrictions).

**11. Remedy Selection Decision Factors**

Any remedy proposed by Respondents shall be evaluated according to EPA's Remedy Selection Decision Factors. The Remedy Selection Decision Factors are five factors that the EPA considers in selecting/approving a remedy that meets the four General Standards listed above. These factors represent a combination of technical measures and management controls for addressing the environmental problems at the Facility. The five factors are:

- a. Long-term reliability and effectiveness;
- b. Reduction in the toxicity, mobility or volume of wastes;
- c. Short-term effectiveness;
- e. Implementability; and
- f. Cost.

The draft CMS Report shall discuss and provide information in support of Respondent's application of these factors in the evaluation of corrective action alternatives. Examples of the types of information required are provided below:

**12. Long-term Reliability and Effectiveness**

Demonstrated and expected reliability is a way of assessing the risk and effect of failure. The draft CMS Report shall consider whether the technology or a combination of technologies have been used effectively under analogous site conditions, whether failure of any one technology in the alternative would have an immediate impact on receptors, and whether the alternative would have the flexibility to deal with uncontrollable changes at the site (e.g., heavy rain storms, earthquakes, etc.). The draft CMS Report shall evaluate each corrective measure alternative in terms of the projected useful life of the overall alternative and of its component technologies. Useful life is defined as the length of time the level of effectiveness can be maintained.

### **13. Reduction in the Toxicity, Mobility or Volume of Wastes**

The draft CMS Report shall discuss how the alternatives employ techniques, such as treatment technologies, to eliminate or substantially reduce the inherent potential for the wastes in SWMUs (and/or contaminated media at the Facility) to cause future environmental releases or other risks to human health and the environment. Considerations include the amount of contaminants destroyed or treated, the degree of expected reduction in toxicity, mobility, and volume, the degree to which the treatment is irreversible, and the type and quantity of residuals remaining after treatment.

### **14. Short-term Effectiveness**

The draft CMS Report shall evaluate the short-term effectiveness of each of the alternatives as proposed. Short-term effectiveness considers the protection of the community and on-site work force (both Facility and remedial) during the performance of the corrective action, along with any short-term environmental impacts. An important aspect of the short-term effectiveness factor is the consideration of the time a remedy requires to attain the media cleanup standards.

### **15. Implementability**

The draft CMS Report shall evaluate Respondent's ability to construct and operate each corrective measure alternative proposed. Key elements include the reliability of the technology, the ease of undertaking additional corrective action (if necessary), and the ability of the Respondents to monitor the effectiveness of the corrective action. Examples of information the draft CMS Report shall consider when assessing implementability include:

- a. The administrative activities needed to implement the corrective measure alternative (e.g., permits, rights of way, offsite approvals, etc.) and the length of time these activities will take;
- b. The constructability, time for implementation, and time for beneficial results;

- c. The availability of adequate offsite treatment, storage capacity, disposal services, needed technical services and materials; and
- d. The availability of prospective technologies for each corrective measure alternative.

## 16. Cost

The relative cost of a remedy may be considered, particularly when several different technical alternatives to remediation offer equivalent protection of human health and the environment, but vary widely in cost. When presenting cost estimates, the draft CMS Report shall include costs for engineering, site preparation, construction, materials, labor, sampling/analysis, waste management/disposal, permitting, health and safety measures, training, operation and maintenance, etc., and shall be presented in tabular form. The cost estimates for the alternatives shall be categorized as capital costs and operation and maintenance costs, and the Respondents shall present the present worth cost of each alternative using a discount rate of five (5) percent before taxes and after inflation.

## 17. Final CMS Report:

Within (60) calendar days of receipt of EPA's comments, Respondents shall finalize the CMS Report incorporating comments received from EPA on the Draft CMS Report, and shall resubmit a Final CMS Report for EPA approval. Within the Final CMS Report, the Respondents may recommend a preferred corrective measure alternative for consideration by the EPA. Such a recommendation should include a description and supporting rationale for the proposed remedy, consistent with the General Standards for Remedies and the Remedy Selection Decision Factors that appear above. EPA will review and/or approve and/or modify this submittal in accordance with Section VIII of the Order. EPA's approval of the Final CMS Report, and any recommendation for a remedy recommended by Respondents shall not bind EPA to select Respondent's recommended remedy as the final remedy selected for the facility.

## TASK II - CORRECTIVE MEASURES IMPLEMENTATION

18. Within sixty (60) calendar days of receipt of notification from EPA that the public comment period for EPA's proposed remedy has been completed and EPA has selected a final corrective action for the Facility, Respondents shall submit a Corrective Measures Implementation (CMI) Workplan to EPA and the Missouri Department of Natural Resources (MDNR). The required CMI Workplan shall specify the work required for the design, construction, implementation, and continued performance monitoring, and completion criteria of EPA's selected final corrective action at the facility. EPA will review and/or approve and/or modify this submittal in accordance with Section VIII of the Order (including the updated SAP, QAPP, Health and Safety Plans and O&M Plans). The CMI Workplan shall include, at a minimum, the following elements:

- a. Introduction/Purpose: The CMI Workplan shall contain a description of the purpose of the document and a summary description of the project;
- b. Summary of corrective action objectives;
- c. Description of the final corrective measure selected by EPA and the rationale for the remedy selection;
- d. Performance expectations;
- e. Preliminary design criteria and rationale;
- f. General operation and maintenance requirements;
- g. Startup Procedures, including all applicable system startup procedures, including operational testing;
- h. Long term monitoring requirements;
- i. Design and implementation considerations to implement the selected remedy, to include, but not be limited to:
  - (1) Anticipated technical problems;
  - (2) Additional engineering data that may be required;
  - (3) A description of any permits and regulatory requirements; and
  - (4) Access, easements and right-of-way.
- j. Cost estimates, including the capital and O&M costs for implementing the corrective action.

**1. Project Schedule** - The CMI Workplan shall also specify a schedule for key elements of the bidding and construction process, and for the initiation of all major corrective action construction tasks.

**2. Updated SAP, QAPP, Health and Safety and O&M Plans** - The CMI Workplan also shall include updates of the referenced plans, either as amendments, or stand alone documents. The updated Plans shall be revised as appropriate to address the requirements of implementing the final corrective action for the Facility. The O&M component of the CMI Workplan shall address all elements set forth below, including but not limited to, Project Management, Waste Management Procedures and Contingency Procedures.

**3. OPERATIONS AND MAINTENANCE PLAN** - Within the CMI Workplan Respondents shall also submit to EPA an Operations and Maintenance (O&M) Plan that outlines procedures for performing operations, long-term maintenance and monitoring of the Interim Measures

required by this Statement of Work. EPA will review and/or approve and/or modify this submittal in accordance with Section VIII of the Order. The O&M Plan shall, at a minimum, include the following elements:

a. **Project Management** - The O&M Plan shall describe the management approach including levels of personnel authority and responsibility (including an organizational chart), lines of communication and the qualifications of key personnel who will operate and maintain the Interim Measures (including contractor personnel);

b. **System description** - The O&M Plan shall describe the Interim Measures and identify significant equipment, as applicable to each Interim Measure. Provide schematics or process diagrams to illustrate system design and operation;

c. **Personnel Training** - The O&M Plan shall describe the training process for O&M personnel, as applicable. Respondents shall prepare, and include the technical specifications governing the operation of the groundwater migration control system and LNAPL systems, and the support requirements for the following:

i. Appropriate service visits by experienced personnel to supervise the installation, adjustment, start-up and operation of the Interim Measure systems; and

ii. Training covering appropriate operational procedures once the start-up has been successfully accomplished.

d. **Start-Up Procedures** - The O&M Plan shall describe all applicable system start-up procedures including any operational testing;

e. **Operation and Maintenance Procedures** - The O&M Plan shall describe all normal operation and maintenance procedures including:

- (1) A description of tasks for operation;
- (2) A description of tasks for maintenance;
- (3) A description of prescribed treatment or operation conditions; and
- (4) A schedule showing the frequency of each O&M task.

f. **Data Management and Documentation Requirements** - The O&M Plan shall specify that Respondents shall collect and maintain the following information:

- (1) Progress Report Information;
- (2) Monitoring and Laboratory data;
- (3) Records of operating costs; and
- (4) Personnel, maintenance and inspection.

**g. Application of Quality and Assurance Project Plan/Sampling and Analysis Plan:**

The O&M Plan shall describe actions necessary to apply the QAPP and SAP (Task I) to ensure that all information, data and resulting decisions are technically sound, statistically valid and properly documented.

h. The O&M Plan shall specify a replacement schedule for equipment and installed components;

i. **Waste Management Practices** - The O&M Plan shall describe any solid wastes/hazardous wastes/LNAPL which may be generated by the operation of the Interim Measures and describe how they will be managed;

j. **Contingency Procedures** - The O&M Plan shall describe, as applicable, the following types of contingency procedures necessary to ensure system operation in a manner protective of human health and the environment:

(1) Procedures to address system breakdowns and operational problems including a list of redundant and emergency back-up equipment and procedures;

(2) Alternative procedures to be implemented if the interim measure systems suffer complete failure. The alternative procedures must be able to achieve the performance standards for the Interim Measures until system operations are restored;

(3) The O&M Plan shall specify that, in the event of a major breakdown and/or the failure of the Interim Measure, Respondents shall notify EPA and MDNR within 24 hours of the event; and

(4) The O&M Plan shall specify the procedures to be implemented in the event that the Interim Measures are experiencing major operational problems, are not performing to design specifications, and/or will not achieve the Interim Measure performance standards.

**4. Corrective Measure Completion Criteria** - The CMI Workplan shall propose the process and criteria for determining when the implemented corrective measures have achieved the corrective action objectives. The CMI Workplan shall also describe the process and criteria for determining when maintenance and monitoring may cease.

**5. Corrective Measures Implementation Report** - Within thirty (30) days after the completion of the implementation/construction activities required by the approved CMI Workplan, Respondents shall submit a Corrective Measures Implementation Report, which shall include at a minimum, the following elements:

a. A statement of the purpose of the Report;

- b. A synopsis of the corrective measure, design criteria, and a certification that the corrective measure was constructed and implemented in accordance with the approved CMI Workplan;
- c. An explanation and description of any modifications to the approved CMI Workplan and design specifications, and why such modifications were necessary and appropriate;
- d. Copies of any sampling/test results for operational testing and/or monitoring that documents how initial operation of the corrective measure compares to design criteria;
- e. A summary of significant activities that occurred during the implementation/construction, including a discussion of any problems encountered and how such problems were addressed;
- f. A summary of all inspection findings (including copies of inspection reports, documents and appendices); and
- g. Copies of as-built drawings and photographs.

**6. Corrective Measures Completion Report** - When Respondents believe that they have satisfied the EPA approved completion criteria, Respondents shall submit to EPA and MDNR a Corrective Measures Completion Report, for review and approval by EPA in accordance with Section VIII of the Order. The CMCR shall fully document how the corrective action objectives and corrective measure completion criteria have been satisfied, and shall justify why the corrective measure and/or monitoring may cease. The CMCR shall, at a minimum, include the following elements:

- a. A synopsis of the corrective measure;
- b. Corrective Measure Completion Criteria - the CMCR shall include the process and criteria used to determine, and recommend, that the corrective measure, maintenance and monitoring may cease;
- c. A demonstration that the corrective action objectives and corrective measure completion criteria have been met. The CMCR shall include results of tests and/or monitoring that documents how operation of the corrective measure compares to, and satisfies, the corrective action objectives and completion criteria;
- d. A summary of work accomplishments (e.g. performance levels achieved, total hours of operation, total volume treated and/or excavated volumes of media, nature and volume of wastes generated, etc.);
- e. A summary of significant activities that occurred during operation of the corrective measure, including a discussion of any problems encountered and how such problems were addressed;

- f. A summary of inspection findings (including copies of key inspection documents in appendices); and
- g. A summary of total operation and maintenance costs.

